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Σημειωτική

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ANIMAL UMWELTEN IN A CHANGING WORLD: ZOOSEMIOTIC PERSPECTIVES

UNIVERSITY OF TARTU
Press

Animal umwelten in a changing world: Zoosemiotic perspectives represents a clear and concise review of zoosemiotics, presenting theories, models and methods, and providing interesting examples of human–animal interactions. The reader is invited to explore the umwelten of animals in a successful attempt to retrieve the relationship of people with animals: a cornerstone of the past common evolutionary processes.

The twelve chapters, which cover recent developments in zoosemiotics and much more, inspire the reader to think about the human condition and about ways to recover our lost contact with the animal world. Written in a clear, concise style, this collection of articles creates a wonderful bridge between human and animal worlds. It represents a holistic approach rich with suggestions for how to educate people to face the dynamic relationships with nature within the conceptual framework of the umwelt, providing stimulus and opportunities to develop new studies in zoosemiotics.

Professor Almo Farina,
University of Urbino "Carlo Bo"

This important book offers the first coherent gathering of perspectives on the way animals are communicating with each other and with us as environmental change requires increasing adaptation. Produced by a young generation of zoosemiotics scholars engaged in international research programs at Tartu, this work introduces an exciting research field linking the biological sciences with the humanities. Its key premises are that all animals participate in a dynamic web of meanings and signs in their own distinctive styles, and all animal species have distinctive cultures. *Animal umwelten in a changing world* reflects the emerging consensus in animal studies that is bringing radical shifts in theoretical, artistic, and historical understanding of rich interrelationships among animals.

Professor emerita Louise Westling,
University of Oregon

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Book series *Tartu Semiotics Library* editors: Kalevi Kull, Silvi Salupere, Peeter Torop
Editors of the current volume: Timo Maran, Morten Tønnessen, Silver Rattasepp

Address of the editorial office:
Department of Semiotics
University of Tartu
Jakobi St. 2
Tartu 51014, Estonia

http://www.flfi.ut.ee/en/department-semiotics/tartu-semiotics-library

This volume has been published with the support of Norwegian–Estonian Research Cooperation Programme grant EMP151 "Animals in changing environments: Cultural mediation and semiotic analysis"

ISSN 1406-4278
ISBN 978-9949-77-280-3 (print)
ISBN 978-9949-77-281-0 (pdf)

University of Tartu Press
www.tyk.ee

Contents

Foreword

Animals *are*. A multitude of different species surrounds us in our everyday doings, and influences our behaviour and culture. Dogs and cats develop delicate and personal relationships with the families they belong to. Swans and geese are waiting to be fed by passers-by. The wing-strokes of doves and jackdaws give a subtle ephemeral atmosphere to our cities. Spiders, snails and snakes are met with surprise or disgust. Beavers are blamed for reshaping the landscapes, and wolves for killing livestock. People and animals engage and interact in a number of ways: from hunting and fishing to bird-watching, from the help provided by assistance dogs to family holidays in zoological gardens and animal parks. Children's first encounters with the written word often take place through animal stories. And many fictional animal characters are known and internationally celebrated by name: Lassie, Moby Dick, Bambi, King Kong, etc.

None of these interactions would be possible without semiotic processes: perception, communication and interpretation occurring between humans and animals. Sign relations or mediated relations that connect humans with other animal species are the very subject of this collective monograph. We make an inquiry into the semiotic character of different species, study the ways in which humans endow animals with meaning, and analyse how animal sign exchange and communication has coped with environmental change. In this research, our core disciplinary framework is zoosemiotics, the semiotic study of animals – the paradigm that was proposed by the eminent American-Hungarian semiotician Thomas A. Sebeok in the 1960s and that recently had its fiftieth anniversary. Our approach is essentially semiotic and biosemiotic. At the same time, we engage in dialogues with ecocriticism, Actor-Network Theory, posthumanism and other contemporary schools of the humanities, as well as with more practically oriented research topics in visitor studies, animal welfare studies and human–animal studies, not to forget ethology and conservation biology.

This book is a collective effort. Its authors belong to the research group in zoosemiotics and human–animal relations based in the Department of Semiotics at the University of Tartu in Estonia, and at the University of Stavanger in Norway. The two opening chapters are written and edited collectively and present a framework of philosophical, historical, epistemological and methodological matters of zoosemiotic research. These initial considerations are followed by specific case studies that have been conducted by individual authors. The specific chapters, however, have been cross-edited and commented on by other

authors of the book so that the whole collection forms an integrated set of viewpoints.

Animal Umwelten in a Changing World follows the work of several subsequent research projects and grants and concludes the latest one, "Animals in changing environments: Cultural mediation and semiotic analysis". The general history of zoosemiotics is discussed in detail in the first chapter. At the University of Tartu, the scholarship in zoosemiotics started, however, in 2000 when ethologist Aleksei Turovski first held a course in zoomythology and zoosemiotics. From 2006 onwards, courses in zoosemiotics have been taught by Timo Maran on a regular basis. Some of the authors of the present book received the grant "Dynamical zoosemiotics and animal representations" (2009–2013) from the Estonian Science Foundation. This was followed by the international research grant (EMP 151) "Animals in changing environments: Cultural mediation and semiotic analysis", part of the Norwegian–Estonian Research Cooperation Programme (2013–2016). Meanwhile, Morten Tønnessen (2011) defended his doctoral dissertation on Uexküllian phenomenology in Tartu and later started his own research initiative in Stavanger, Norway. This added valuable insights to zoosemiotic studies from phenomenology and animal philosophy, environmental history/archaeology and multimodal discourse analysis.

In the framework of the research projects, three large international conferences have been held with a focus on zoosemiotics or semiotic studies of animals: "Zoosemiotics and Animal Representations" (Tartu, Estonia 4.–8.04.2011), "Framing Nature: Signs, Stories, and Ecologies of Meaning" (Tartu, Estonia 29.04.–3.05.2014), and "Animals in the Anthropocene: Human–animal relations in a changing semiosphere" (Stavanger, Norway 17.–19.09.2015). Related to the research grants, an anthology (Maran *et al*. 2011), three special issues of academic journals (Martinelli, Lehto 2009; Tønnessen, Lindström 2010; Maran 2014) and two essay collections (Tüür, Tønnessen 2014; Tønnessen, Armstrong Oma, Rattasepp 2016) have been published on zoosemiotic topics. In addition to these organising efforts, specific zoosemiotic case studies have been made on several topics by the participants of the research group: human–animal interactions in zoological gardens, communication in the teams of visually disabled persons and guiding dogs, animals in nature writing, semiotics of the animal condition in philosophy, the changing interactions of wolves, dogs, sheep and farmers, historical changes in the role of animals in human households, and developments in the cultural perception of novel species. Many of these specific topics form chapters of this book. Based on these considerations, the present monograph can be also considered as a report of the state of the art of zoosemiotic studies in the Tartu semiotic school.

The authors of the book are grateful to Aleksei Turovski and Dario Martinelli for their efforts in launching contemporary zoosemiotic studies, to the professors Kalevi Kull and Peeter Torop as well as other members of the Tartu Semiotic

School for their guidance and supportive intellectual environment, to Ivo Volt and his colleagues at University of Tartu Press for their help in issuing this volume, and to the Norwegian–Estonian Research Cooperation Programme (2013–2016; EMP151) for financing the most recent research.

The authors

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Introducing zoosemiotics: philosophy and historical background

Timo Maran, Morten Tønnessen, Riin Magnus, Nelly Mäekivi, Silver Rattasepp, Kadri Tüür

1. Animals as objects and subjects of semiotics

Zoosemiotics, or the semiotic study of animals, is a research field that is situated between the biological sciences and the humanities. This claim is accurate with regard to the history of the discipline, its theoretical position and basic concepts, and its methodology and research objects. Semiotic studies of animals were originally very much associated with the legacy of Thomas A. Sebeok (1920–2001) and his research program of zoosemiotics, defined as a "discipline, within which the science of signs [semiotics] intersects with ethology, devoted to the scientific study of signalling behavior in and across animal species" (Sebeok 1963: 465).[1] More recently, zoosemiotics has been specified as "the study of signification, communication and representation within and across animal species" (Maran *et al*. 2011: 1). As such, semiotic studies of animals constitute an interdisciplinary research effort that aims at studying the semiotic activities of animals and their relations to human culture. At the same time, it is also necessary to study the ways in which humans represent and interpret the semiosic activity of animals, in order to achieve a better understanding of the limits and possibilities of human–animal interactions.

The understanding of animals as a research object of semiotics integrates the humanities and the biological sciences. On the one hand, zoosemiotics stands close to animal studies, posthumanism and other similar fields within the humanities, in its emphasis on the subjectivity of animals. The subjectivity of animals is understood here as the active participation of an animal individual in a semiotic web of meanings, in communicative relations, and also in human discourses. Animals are treated as active participants in semiosis, that is, as interpreters of signs, and as being related to other animals and the environment through perception-action cycles (*functional cycles*, see below). The understanding of animal subjectivity goes hand in hand with valuing qualitative aspects in animal

[1] On Thomas A. Sebeok's work in zoosemiotics, see the next chapter "Methodology of zoosemiotics: concepts, categorisations, models".

appearances (Portmann 1960, 1990), expressions and representations, as well as the use of the methodological tools necessary to study qualitative phenomena.

On the other hand, zoosemiotics is close to the biological sciences in its empirically based attention to the diversity of animal species and to their perceptual, expressive and cognitive capacities. This means that zoosemiotics does not treat an animal just as a general singular (for criticism, see Derrida 2008; Rattasepp 2015), but focuses on the physiology, ecology and communicative capabilities of every species studied. Different species are considered as having a subjective integration with the world via their specific ecological niche and umwelt[2] – which is related to the necessity of studying animals in relation to contexts and environments (which could be considered to be the third characteristic feature of zoosemiotics, see below). The character of the semiosic activity of the species needs to be taken into account in studying cultural representations of animals as well as in regard to human–animal relations. In this emphasis on species-specificity, zoosemiotics shares the biological sciences' understanding of the diversity of animal life. However, some zoosemioticians have also criticised an exaggerated emphasis on species-specific traits even in bio- and zoosemiotics (see e.g. Lestel 2011: 84; Tønnessen 2011: 19–20), and have called for more focus on intra-species diversity.

Zoosemiotics starts with the general biosemiotic conviction that semiosis (sign process) and life are interconnected or interdependent. This idea was originally proposed by Thomas A. Sebeok in his attempt to widen the range of semiotic phenomena to cover all living organisms: "the process of message exchanges, or semiosis, is an indispensable characteristic of all terrestrial life forms" (Sebeok 1991: 22). In this endeavour, Sebeok's views oppose most representatives of European semiology, who consider language and language-based sign systems to be the sole objects of semiotics. Sebeok also did not share the view of a radical discontinuity between animal and human semiosis, as he discussed communication and interpretation in animals and studied artistic behaviour, individual recognition and other higher cognitive processes in animals as forms of nonverbal communicative behaviour. As Sebeok points out, the basic communicative channels are similar in all animals, including humans. At the same time, human natural languages are but one specific means of communication. Consequently, whereas the content of human speech may be inaccessible to other animals, the tone of the utterances, gestures, bodily postures, smells, and other bodily features of human communication are not. This implies that various pre-linguistic signs not only exist, but that they are also perceivable and intelligible across species.

Thus, in zoosemiotics, semiosic properties are treated as essential characteristics of animal life. In addition to zoosemiotics, animals can also be studied

[2] Umwelt is Jakob von Uexküll's concept for the aspects of the environment that are perceived, meaningfully organised and responded to by an animal.

from other semiotic perspectives, such as cultural semiotics, language semiotics, and sociosemiotics, but these approaches focus on animals as denominators in language and culture and do not include the semiosic activity of the biological organisms themselves. There are also numerous instances that suggest a strong interconnectedness and no clear-cut divisions between zoosemiotics and branches of semiotics rooted in culture. In addressing this issue, the zoosemiotician Dario Martinelli has proposed to incorporate our interpretations of other species into the realm of zoosemiotics under the name of anthropological zoosemiotics (Martinelli 2010: 121–170). As a practical example, in the field of species conservation, most conservation programs have focused on large charismatic mammals (Adams 2004), giving much less attention to other species whose umwelten are less similar to ours. Many of the decisions made in conservation stem from the perceptions that people hold of other species, and these perceptions are in turn established by our own biological heritage.

2. The specifics of the animal condition

In biosemiotic understanding, various semiosic processes differ in their complexity and take place at different levels of biological organisation. It is possible to distinguish between semiosis as taking place inside the animal body, semiosis between animal individuals, and semiosis on the level of biological communities and ecosystems. Whereas the first is seen as a subject matter of endosemiotics and the last of ecosemiotics (or ecosystem semiotics[3]), the middle ground – semiosis of and between animal individuals, with an attention on morphological, meaning-carrying traits, as well as on communication and representation – forms the scope of zoosemiotics (for discussion and detailed typology, see Tønnessen, Tüür 2014). There are several characteristics that are specific to the zoosemiotic level – the level of the animal individual – as compared to other levels of the semiotic organisation of nature. Due to their developed perceptor organs, most animals are capable of perceiving their surrounding environment, including other animals, in a temporarily and spatially organised way. As such, animals – unlike ecosystems or cellular structures – have meaningfully organised perceptions, that is, a model of the world (umwelt). The presence of an umwelt also means that an animal is able to perceive its own location or position in relation to the surroundings, and also to change its location or perspective. Together with the ability to move,

[3] Ecosemiotics is a complex field of research that draws from different historical backgrounds and which has been defined in various ways by different scholars, as for instance: the semiotic aspect of human ecology or the study of nature in cultural semiotics (Kull 1998), the study of signification between animal organisms and their environment (Nöth 2001), or of semiotic processes on the level of ecological systems and the biosphere (as ecosystem semiotics, Nielsen 2007). Here we refer to the latter use.

the umwelt-structure endows animals with novel semiotic capacities: 1) spatial semiosis as an ability to perceive, use and communicate through spatial marks, measurements and relations; 2) orientation as an ability for directed movement in space, and related capacities of memorising spatial relations; and 3) search behaviour (tracking, search image, category-based recognition) for recognising and locating environmental resources and species-mates in the environment.

In semiotics, a basic distinction is drawn between types of signs on the basis of the relation of the sign vehicle to its object. All three types in this typology – icons (based on a similarity between object and sign vehicle), indices (based on a causal relation between object and sign vehicle) and symbols (based on a habitual connection between object and sign vehicle) – take part in animal communication. Icons are present, for example, in the form of simple cues, patterns and imprints, and indices as tracks, territorial markings, and many gestures signalling motivation. The question of symbols in animal communication is complex and hinges on the particular definition of the concept of symbol (e.g. with reference to other signs in the sign system, arbitrariness or conventional habituality); nevertheless, several authors have claimed that behavioural rituals and courtship displays can be treated as symbols (Sebeok 1990: 42; Maynard Smith, Harper 2003: 59) due to there being no motivated connection between the sign and the object. In some cases, the designation of the sign type may be unclear. For example, some bird species and marine mammals are known to address their individual group members with a unique sequence of sounds. This is similar to name-using in humans, and proper names belong to the category of symbolic signs (Lotman, Uspenski 1978: 211–234). At the same time, the sound used for addressing a fellow wren, for example, may imitate the song of the particular individual, having thus the qualities of an audial icon.

From these three basic types of signs, animals appear to take the most advantage of relation-based indexical semiosis (cf. Kull 2009). Indexicality further relates to other important characteristics of animals, such as orientation/differentiation along the inward-outward axis (cf. Portmann 1990), and to inter-individual communication. Although the ability to distinguish self from non-self appears to be present in simpler levels of biological organisation (Sebeok 2001b), these are indexical relations (and the Peircean category of secondness), through which other organisms are perceived as "the other" and which thereby pave the way for social relations and intraspecific communication. Different forms of indexical relations (spatial perception, orientation, communication by means of the environment) lend a dynamical character to animal semiosis. This means that the methodology and research methods in zoosemiotics need to be suitable for describing both the dynamical, changing, and interactional semiotic processes and need to take into account their embodiment, contextuality, and relationality to the environment.

3. Diversity of umwelten

It was remarked above that zoosemiotics aims to take into account the plurality of life forms and their distinctive semiotic character. In doing this, zoosemiotics has found considerable inspiration in the umwelt theory of Jakob von Uexküll (Uexküll 1921, 1928, 1940 [cf. 2010], Uexküll, Kriszat 1934 [cf. Uexküll 2010]). An umwelt, in Uexküll's sense, is the subjective world of an animal that corresponds to its body plan and perceptual and effectual organs, and which consequently forms the only perceivable reality for it. Although umwelten are described by Uexküll as species-specific, the perceiving and acting unit is still an individual animal. More specifically, Uexküll considers the umwelt to be the fusion or totality of two main elements: the *Merkwelt*, i.e., the specific perceptual field of a given organism, and the *Wirkwelt*, i.e., the field of actual interaction, the operational dimension of the same organism (Uexküll 1982). Perceptual and operational factors contribute to form a specific umwelt, which is exclusive for each species (and to some extent, for each individual). Uexküll's concept of umwelt provides zoosemiotics with its fundamental principle that any animal lives, perceives, acts, and communicates in its own subjective world. As a result, the communicative abilities of every species must be observed on the basis of the structure of its umwelt. For example, many cases of biological mimicry are deceptive within the umwelt of those species that are engaged in an evolutionary involvement with an imitator, but that same resemblance may be not deceptive, and may not even be perceivable, for other species in the ecosystem.

Accordingly, communication systems, communication channels and ranges used by different species differ significantly. Studies of the various animal species' communicative abilities that remain outside the human umwelt – ultraviolet markings, pheromones, tactile perception – here serve as good examples. Such diversity should not be viewed as forming a hierarchy, but rather the specific peculiarities of different communication systems should be emphasised and investigated. For instance, studies have demonstrated the complexity of birdsong on the syntactic level (comparable to the semantic complexity of human languages, see Salwiczek, Wickler 2004). Conveying the same meaning by various different syllables should not always be interpreted, however, as something less than human language; there is, indeed, the possibility to see it as something extra, such as emphasising, for instance, the aesthetic dimension in avian communication.

In studying cultural representations of animals, we should also be aware that our perception and understanding of animals is biased by our own umwelt structure. Many features, forms of communication, modalities and, indeed, even entire species are often underrepresented since they are not present in our umwelten. At the same time, understanding the human umwelt structure (that is, the basic functional distinctions and meaning categories which we use for making sense of the environment), also aids us in analysing human–animal relations. In recent decades, approaches that acknowledge and focus on the ontological

diversity of umwelten have been also emerging outside of semiotics, in the form of multispecies ethnographies (Kohn 2013; Münster 2014; Smart 2014) and more-than-human geography or hybrid geography (Whatmore 2002; Lorimer 2010; Philo, Wilbert 2010). Some authors have welcomed these developments as a "species turn" (Kirksey, Helmreich 2010).

Yet another important concept from Jakob von Uexküll, one which was later employed and developed in psychology and cybernetics, is the functional cycle (or *Funktionskreis*, Uexküll 1982). The functional cycle describes the relation between a living being and an outer environmental object as consisting of two complementary processes – perception and effect. Those processes, however, do not proceed causally but are instead mediated by the animal's meaning-attributing activity. The core of Uexküll's functional cycle describes a process of selective perception and interpretation, with further reaction or feedback following the interpretation. As a principle of coupling, the concept of the functional cycle allows for analyses of the different relations that animals have with the objects in their environments, with other animals of the same or different species, and between animals and humans. Furthermore, functional cycles provide the ground for analysing semiotic interactions at the communal level, either in social groups or in biological communities. Accordingly, on the level of the ecosystem the environment cannot be conceived in the abstract – for example, the forest as such – but only as the environment as a sum of umwelten: the forest of an ant, a fox, a man, and the complex ways in which these combine, correspond and interact. From the zoosemiotic perspective, an analysis of biological communities should be conducted first of all as a study of the interactions of animal umwelten.

4. Environmental semiosis

Indexicality and the umwelt-structure of animal semiosis are related to the notion that semiotic studies of animals must pay attention to contextual and environmental aspects. Attentiveness toward meaning relations that connect the animal to the surrounding semiotic structures – either to the rhythms of the environment or to the cultural meanings and social functions in the case of animal representations – is a characteristic feature of the zoosemiotic approach. For zoosemiotics, an animal as an object (and a subject) is necessarily situated; put more precisely, as a living individual it situates itself through its semiotic activities in the surrounding environments and contexts.

The emphasis on contextual and environmental relations may have different practical outcomes, such as attending to the role that environmental enrichment plays for captive animals (see Mäekivi, this volume), the challenges presented by the urban environments for guide dogs (see Magnus, this volume), the effect of environmental change on animal representations, etc. An animal's semiosic

activity and the environment are closely interlinked since, first, perception and communication always take place in particular kinds of environment and depend on the environment's properties and, second, animals often make use of mediated communication in which messages are imprinted on environmental structures (signs, traces, etc.) or where the environment is changed such that this change is meaningful for other species (territorial markings, nests, etc.). In addition, the environment that animals inhabit may be subject to human influence, which blurs the boundaries between zoosemiotics and other fields that study human–environment relations.

Many authors have elaborated on environmental semiosis and the types of signs specific to these semiotic processes. Winfried Nöth (2001: 71) states that "ecosemiotics is the study of environmental semioses, i.e. the study of sign processes which relate organisms to their natural environment" by focusing mostly on natural signs and signification. Thomas A. Sebeok (2001a) has discussed indexical signs in his six species typology of signs. He lists "symptom, cue, clue, track, trail" as synonymous with the index, and provides several examples from animal and environmental communication (traces and tracks of animals, the dance code of honey bees, the behaviour of the great honey guide). Charles Peirce's classification of indexical signs distinguishes between designators and reagents (CP 8: 368 fn23), both of which can also be found in environmental semiosis. Designators are the signs that point to something in the environment, which can be exemplified by the dance code of honey bees, whereas animal tracks would be classified as reagents, since they are signs based on causal connection. Natural signs also form an important part in understanding the relation between human language and the environment, the tradition within which the works of the Scottish philosopher Thomas Reid stand as an important milestone (Reid 1764; discussed in Sukhoverkhov 2012).

Both everyday experience and studies in ecosemiotics suggest that there are a variety of signs in the environment. As an example, we can compare animal tracks with a seasonal sign, such as the melting of the snow. Animal tracks are specific forms that have a strict physical relation to the animal that has left them, and as such they exemplify a specific and well-limited sign relation to the referent or object. The object of the melting snow, which is presumably spring or seasonal change, is ambiguous and more of a compound object than a singular entity. Zoosemiotics, as well as general semiotics, would benefit from a clearer typological understanding of the possible types of environmental signs. Thinking of and analysing the processes of environmental semiosis in exact terms facilitates a better understanding of the umwelten of other species. It also helps us to estimate the human impact on them in the form of physical intervention through environmental change.

5. The history of semiotic studies of animals

5.1. Reconstructing prehistory

The history of studies in animal communication is older than zoosemiotics. A look back at the development of zoosemiotics makes it apparent that previously separate influences and lines of thought tend to gain relevance and come together at certain points in the discipline's history. Research on animal communication can be reconstructed as going back to the works of Aristotle in Greek Antiquity. In Medieval and Enlightenment philosophy, too, the communicative and cognitive capacities of animals were discussed (most notably in the works of St. Augustine, Hume, and Locke). Much of the history of thought on animal cognition and communication can be construed as an opposition between two positions in the debate on whether the difference between human and animal capacities is that of type (qualitative difference) or degree (quantitative difference). The works of Charles Darwin have also had a role in preparing the ground for zoosemiotics. In his later works, Darwin (1871, 1872) laid the foundation for the comparative perspective for studying the behaviour and communication of humans and other animals, made observations about the communicative behaviour of pets, and introduced relevant theoretical concepts (e.g. antithetic pairs of expression). Darwin's works on animal cognition and communication were later elaborated by George J. Romanes (1882) in the US, widely considered to be the founder of comparative psychology.

Throughout the early zoosemiotic works of Thomas A. Sebeok (1972), there are reverberations of behaviourist methodologies, as proposed by Charles Morris, as well as echoes of the works of Julian Huxley, Konrad Lorenz, and other ethologists who had studied ritual behaviour in animals. From among the classical concepts of ethology, "search image" (derived from Uexküll's notion of *Suchbild*), imprinting, and the understanding of the complexity of animal communication systems have found widespread use in zoosemiotics. From the mid-1970s onward, Sebeok started to popularise the legacy of Jakob von Uexküll, and elements of Uexküll's theory of meaning began to appear extensively in zoosemiotic writings. Zoosemiotics has been much influenced by German philosophical biology (Jakob von Uexküll, Adolf Portmann), Gestalt psychology, and classical ethology (Konrad Lorenz, Niko Tinbergen, Karl von Frisch). For example, Adolf Portmann (1960, 1990) laid emphasis on appearance as a meaningful animal form, the inward-outward orientation of the organisation of an animal's body, and the special position of skin as a communicative organ, all relevant for zoosemiotics.

5.2. The classical era

The history of zoosemiotics proper begins in the 1960s. In 1961, Peter Marler, a researcher of animal communication, published an analytical paper "Logical analysis of animal communication" (1961). In this paper Peter Marler develops the first properly semiotic approach to animal communication, building on the classical works of Charles Morris, Colin Cherry, Charles K. Ogden and I. A. Richards. In his description of a specific animal communication system (the song of the chaffinch), he makes use of Morris's distinction between identifiers (signifying a location in space and time), designators (signifying characteristics of objects or the environment), appraisors (signifying a preferential status or situation), and prescriptors (signifying the specific responses that are required). Peter Marler continued to be associated with zoosemiotics, publishing papers in collections edited by Thomas A. Sebeok, and studying topics close to zoosemiotics (e.g. the referential dimension of animal communication, comparative analysis of birdsongs and human language). In fact, research into the communication of birds has provided much insight for zoosemiotics. In addition to Peter Marler, who began his academic career in bird ecology, other ornithologists have also contributed to the development of zoosemiotics, such as W. H. Thorpe (who elaborated Hockett's list of the design features of human language, and provided semantically organised lists of repertoires of bird vocalisations) and John W. Smith (who developed the understanding of the importance of context and contextual information in animal communication, Smith 1965, 1969). In this context, Jack P. Hailman's (2008; Hailman *et al.* 1985) research on communication codes and syntax in bird vocalisation is also relevant.

Thomas A. Sebeok's role in developing zoosemiotics has been essential and multifaceted. He proposed the concept of zoosemiotics in 1963, organised the semiotic study of animal communication by developing an international network, and edited three large collections of papers (Sebeok 1968, 1977; Sebeok, Ramsay 1969). He also published on specific aspects of animal communication and semiotics, such as the question of lying in animals, codes and coding in animal communication, proper names in animals, aesthetic behaviour in animals, semiotic relations between humans and animals, and so on (Sebeok 1972, 1990). Looking back at the development of Sebeokian zoosemiotics, we can distinguish three different stages in his thought: the communicational period of 1963–1972, the philosophical period of 1972–1990, and the later biosemiotic writings of 1990–2001 (Maran 2014b). The first period of his research centres on animal communication and its linguistic aspects, with a special emphasis on codes and coding; the second period incorporates the legacy of Uexküll and Peirce into zoosemiotics, and critical views towards animal language studies are developed; the third period saw the development of specific issues, such as the concept of the "semiotic self", and discussions of the position of zoosemiotics in biosemiotic studies.

An important resource for zoosemiotics is the practically-oriented research in zoological gardens. Heini Hediger, the founder of zoobiology, put forth a typology of personal spatial spheres and studied the use of space by animals (Hediger 1968, 1969, see Chap. 2). He also developed methods for animal diagnostics (based on animal expressions and symptoms in the zoo environment) and for distinguishing the different meanings that humans have for animals and vice versa. A semiotic interpretation and elaboration of Hediger's work was later provided by Aleksei Turovski (2000). Zoosemiotic research has been conducted in different institutions in which animals are kept in captivity. Paul Bouissac (2010) has studied the cultural and communicative aspects of circuses, reflecting on the taming of animals and on dressage. Nils Lindahl Elliot (2006) has described semiosic processes in zoological gardens, whereas Dominique Lestel (2002) has studied the specifics of communication in mixed communities of humans and apes in research laboratories. Furthermore, Gregory Bateson's (1966) early theoretical reflections on the hierarchical nature of mammalian communication were based on his experiences with dolphins in marine biology labs.

In addition to zoosemiotic approaches to animals (that is, studies that take into account the semiosic activity of animals themselves), there are semiotic works on animals that depart from the anthropological, historical, literary or linguistic studies. In general, we can say that semiotic studies of animals in this wider sense do not start before 1960s, and many of them fall into the classical era of zoosemiotics. Several studies focus on the meanings of animal names and behaviours in different cultures and languages (e.g. Schmauks 2014; Stetkevych 1986; Costa Neto 2006), the connotative meanings of animal species and their pragmatic use in different cultural contexts (e.g. Hewes 1994; Schmauks 2000), and the history of understanding animal communication (e.g. Eco *et al.* 1984; Eco 1985; Percival 1982). Outside of semiotics, the study of animal communication has been on the agenda of many scientific disciplines, e.g. classical and cognitive ethology, comparative psychology and behavioural ecology which have produced a large body of knowledge on structural, evolutionary and cognitive aspects of animal communication (see for overviews Hauser 1996; Bradbury, Vehrencamp 2011; Stegmann 2013). On a more mediated level, in ecocriticism it has been studied, among other topics, literary representations of animals throughout its existence. In recent years, the efforts of literary scholars have often been joined with those made in human–animal studies (cf. Phillips 2010; Pollock, Rainwater 2005). Combining ecocritical literary studies with zoosemiotics may also open up interesting insights into the modelling of human–animal interaction.

5.3. Contemporary developments

In the last decade we have witnessed the integration of zoosemiotics with the environmental humanities and the development of anthropological zoosemiotics,

to use the term established by Dario Martinelli (2010: 121). In this development, it is possible to distinguish between two directions of research, both moving outwards from "zoosemiotic proper". First, zoosemiotics is interested in non-verbal or indexical semiosis that takes place in human communication and culture by focusing on proxemics, phatic communication, zoosemiotic (umwelt-based) modelling, onomatopoetic and other analogy-based expressions in human culture, etc. Studying nonverbal human semiosis is also an important aspect in understanding human–animal relations as specifically non-verbal aspects of human communication can be involved in interspecific relations, whereas our language-based communication is mostly not accessible to the members of other species.

On the other hand, zoosemiotics is interested in studying representations of animals in literary texts, art, and discourse, with reference to the semiosic and communicative capacities of animals themselves. Such an approach allows research on questions regarding how human representations relate to animal semiosic activities, to what degree they distort animal communicative agency, and how representations of animals can subsequently shape human action and thereby influence animals themselves. This development can also be characterised by an emergence of research objects that are far from ordinary communication: artistic behaviour in animals (see Mandoki 2014), tracks and traces (Vladimirova, Mozgovoy 2003), play behaviour (Tønnessen 2009), mimicry resemblances (Maran 2010), domestication (Kleisner, Stella 2009), etc.

Special attention should be reserved for the emerging synthesis between zoosemiotics and cultural or literary criticism. Such synthesis could be built upon several approaches, such as a common ancestry of humans and other animals, human–animal communicative relations, corporeal and endosemiotic aspects of humans related to linguistic activities, and analogies between semiosic processes in humans and other animals. An example of such a synthesis is the development of semiotically accentuated zoomusicology, mostly as a result of the research and organising work of Dario Martinelli (2002, 2009), who has been the most vigorous proponent of zoosemiotics since the 2000s. Among other things, Martinelli has developed a list of zoosemiotic universals in music and has discussed the problematics of etic and emic approaches to animal expressions. Another example of such an endeavour is the incorporation of the semiosis of animals into ecocritical studies, which either focus on general premises (Wheeler 2010; Maran 2014a) or on specific case studies, such as for example the zoosemiotic basis of depicting birds in field guides and nature writing (Tüür 2009). Such a synthesis may pave the way to new theoretical insights, such as the issue of narratives and narrativity in zoosemiotic material, or the application of Sebeok's distinction between zoosemiotic and linguistic modelling of literary texts.

These recent developments can be characterised as putting zoosemiotics into a larger context, and as including cultural and social aspects in the study. As such,

zoosemiotics should not be construed as a theory that focuses narrowly on one type of semiosic process – animal semiosis – but rather as a study of the entire semiotic field with its different traditions, exercised with a particular sensitivity towards animality. This vantage point entails important inferences regarding the method of zoosemiotics and its applications. The first wave of zoosemiotics in the 1960s focused narrowly on the investigation of the relationship between animal and human communication. In contrast, modern zoosemiotics strives to widen its scope in order to encompass different types of semiotic relations with respect to animals, and to avoid excluding the social, historical and cultural dimensions. This development is characterised by the integration of zoosemiotics with other fields interested in animals, such as posthumanism, animal welfare studies, animal ethics, and others.

6. Epistemology: how do we know about animals?

Zoosemiotics, or semiotically informed animal studies more broadly, seeks to describe meanings and sign relations in animals and between animals and human culture, and therefore it inevitably encounters epistemological as well as methodological problems concerning how humans can know about meanings created by animals. Representatives of other disciplines working with animals (ethology, animal psychology, or communication theory) have considered the issue of non-human meaning as a problem better to be avoided. The other paradigms do not speculate on the questions of meaning or interpretation, and attempt to overcome this question by different means, such as by using more objectified terminology or quantitative description. Zoosemiotics on the other hand focuses precisely on this issue of meanings in animals. In his approach to zoosemiotics, Thomas Sebeok placed great emphasis on the referential dimension of communication (which relates a message to the surrounding context and to the semantics of signs) and claimed that the referential dimension is of key importance for zoosemiotics.

A crucial methodological and philosophical question for zoosemiotics is how do we get to know which elements of the environment or a message used in communication are meaningful for the receiving animal, and in what sense. This problem is well described by the ethologist Timothy Johnston, who emphasises the need to make a distinction between signal and sign-carrier. With reference to firefly communication of emitted light signals, he writes: "The distinction between the signal and the sign-vehicle is important […]. We may know that a flashing light serves as a signal, but be unable to decide whether it is the light or the flashing that acts as a sign-vehicle and is hence a sign in that it stands to somebody for something" (Johnston 1976: 47). The need to recognise the difference between the signal and its meaningful components is also the reason

why the American communication theorist John W. Smith (1965) proposed a distinction between "message" and "meaning". In his interpretation, a message is a transmitted signal that contains some information about the sender or corresponds to the sender's behavioural or physiological status. Meaning, on the other hand, is everything that the receiver gets from the message, the way that the receiver reads or interprets the message. Smith's distinction proceeds from the observation that there are indeed many situations in nature where different receivers interpret the same message quite differently. In other words, in the course of communication, information appears to change and, correspondingly, the observer does not have the same perception or interpretation of the process as does the animal participant.

In order to understand what the chances are for zoosemiotics to analyse the meaning processes in other living organisms, let us first scrutinise the available criticisms against such a possibility. The critical position arises mostly from the complex of modern and postmodern views that associate human intellectual existence with human language. This complex of views has taken several different forms (from Kantian enlightenment to analytical philosophy to Derrida's postmodernism), but central to it is the belief that it is language that is the main characteristic feature of humans, that it is language that is the sole bridge for humans to reach the external world and which simultaneously limits the human possibilities of being connected with the world (see Rattasepp 2015). What appears to follow from this is that the human ability to know about other biological communication systems is hindered twice: first by the difficulty faced by humans to acquire information from outside of the limits of human language and, second, by the difficulty of accessing the logic of other communication systems. Such a position presupposes, however, a quite specific understanding of human language that focuses on its systemic and formal properties and downplays its dynamic, dialogic and contextual aspects – aspects which could form a bridge to the communicative abilities of other species. It also presupposes quite a specific understanding of human beings, according to which thinking in linguistic categories is considered to be the essential criterion of human nature. On the other hand, in various philosophical accounts the understanding of animal communication is often perceived to rely on meanings and the semantic dimension more than may be warranted. Although animal meaning is an important issue for zoosemiotics, for the purposes of comparative and systematic descriptions zoosemiotics also analyses the communicative situation, the sign repertoire, and other formal properties. Even among Sebeok's own zoosemiotic set of research questions, only one out of six focuses explicitly on the semantic dimension. In the six research questions, the first three pertain to the pragmatic dimension of communication; the next two deal with the syntactic features of animal communication, and the last one, concerning semantics, is partially deducible from the previous ones, or at least must not be in contradiction with

them. As such, the semantic dimension can be studied in the context of all other aspects of animal communication (for Sebeok's set of research questions for studying animal communication, see the next chapter).

Many presumptions concerning the semiosic activities in humans and their corresponding lack in animals can be shown to be fallacious. For the sake of practical research aims, zoosemiotics needs to put forth criticisms against such views, but in this endeavour, it definitely is not alone and can find allies in posthumanism, actor-network theory, speculative realism, and other contemporary intellectual movements.

The basic philosophical points that zoosemiotics can present in support of its case for studying meaning processes in the animal world are as follows:

1) In addition to having a formal structure, human language is also dynamical, interactional, and contextual. It is coupled with and informed by the surrounding environment. Even if purely mimetic representation is impossible, language as a complex modelling device is rich in analogical representation.
2) Humans are animals, we are endowed with pre-linguistic zoosemiotic modelling capacities (cf. Sebeok's zoosemiotic modelling, Polanyi's tacit knowledge), and much of human perception and communication takes place by non-verbal means. As such, understanding meanings in animals is related to understanding human zoosemiotic modelling.
3) In practice, we are interacting with animals (e.g. domesticated animals) by communicative and behavioural means; humans and animals make sense of each other and make use of each other. Humans develop their communicative skills through living and learning in a society, which employs different kinds of signs, and the same holds for other animals. As Irene Pepperberg's ethological research on avian cognition has nicely demonstrated, if one wants to teach a system of signs to another species that would allow for interspecific communication, the first thing to do is to let the animals live in an environment in which these signs are in daily use (Pepperberg 2002).
4) Communication systems and cultural representations of animals do not arise from nowhere. Our interactions with other animals have an evolutionary and cultural history; in other words, they are historically contextualised with our cultural and biological past with other species. A good example of this is the long-term symbiotic co-inhabitance of humans and dogs, which has resulted in the development of human-like social skills in dogs (Hare, Tomasello 2005). This means that our canine companions are integrated into human society not only in functional terms, but also in terms of a shared system of signs.

As an epistemological position, these points can be further simplified and combined into a few basic principles. Namely, zoosemiotics can come to grasp animal meanings through comparative, participatory and context-sensitive (reciprocal) approaches, as applied to different research objects with different emphases (as shown in the following table):

1. Approach	*2. Sphere of interest*	*3. Emphasis*
1. Comparative modelling	1. Human and animal communication	1. Social, cultural, and biological contexts
2. Participatory research	2. Interactions of humans and animals	2. Nonverbal semiosic relations
3. Contextual (reciprocal) analysis	3. Animal representations in culture	3. History of animal semiosis / human culture

Thus, for example, a zoosemiotic research project may be developed as a contextual (reciprocal) analysis (1.3) of human–animal relations (2.2) with an emphasis on their social, cultural and biological contexts (3.1). An analysis aware of contextuality and reciprocity would combine different viewpoints and research methods in order to highlight relational environmental aspects, as well as reciprocal semiotic processes and activities, which are considered to take place in mutual directions among the participants (and/or between the research object and the researcher). From this perspective, human–animal relations are studied with an understanding that the involved human and animal counterparts are necessarily historically rooted in social, cultural and biological backgrounds in particular, specific ways. In principle, an approach of this type has been applied in the case study of novel species management used for the analysis of the European jackal in Estonia (see Maran 2015).

The table above does not presume to cover all the possible approaches to zoosemiotic research; instead, it illustrates the logic by which research projects may be constructed. Furthermore, zoosemiotics often combines those different approaches with different viewpoints and angles working complementarily and in comparison with each other. It uses different research instruments in a toolbox-like manner and compiles a suitable set of methods for the specific research task at hand. In such a study, the presence of different approaches itself becomes the measure of the quality of the description. In its practical applications, zoosemiotics can use umwelt modelling, communication analysis and other tools described in more detail in the next chapter.

Acknowledgements

The research for this chapter was supported by the institutional research grant IUT02-44 from the Estonian Research Council and by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Methodology of zoosemiotics: concepts, categorisations, models

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1. The need for methodology

Animals and human–animal relations are studied in a number of different research paradigms deriving from biology, medicine, sociology, philosophy, literary criticism, and others. Each and every one of them brings along its own methodological character and style of research – from the quantitative and strict approaches in anthrozoology and sociological research to the open and reflective reasoning of critical studies. In this array of different possible approaches, zoosemiotics and semiotic studies of animals try to hold a middle ground. The research objects of zoosemiotics are complex as a result of their individual character, of the biological and semiotic variety of animal species, and of the many possible human–animal interactions. This has resulted in a need for a well-forged methodology. Common methodological devices are a prerequisite for developing any systemic and comprehensive understanding of animal semiosis, since they make it possible to compare different species and case studies, and provide zoosemiotics with some capacity for prediction. At the same time, however, zoosemiotics is inclined toward qualitative methodologies and research methods. Quantitative methods and statistics-based analyses, commonly used in biology and other life sciences, may well form a background for zoosemiotic research, but asking qualitative questions is always in the foreground. Instead of rigid concepts, structural distinctions and categories, methodology in zoosemiotics is best understood as dynamical and adjustable. There are, nevertheless, a few key assumptions that we consider to be the general methodological grounds for zoosemiotic research:

1. In any research task, the attention is on semiotic processes (semiosis, recognition, communication, environmental affordances, naming, representations, etc.). Any research object is considered to be predominantly semiotic (having its specific character due to semiosic relations).

2. Living organisms are considered to be subjects and agents, capable of creating their own umwelten and participating actively in semiosic processes. Living organisms are typically individual and always context-bound.
3. The researcher is semiosically connected to the research object. The interaction between the researcher and the object is acknowledged as part of the research situation. In addition, concepts and descriptive language are also part of that situation; rather than being predefined, they develop and change according to needs.

These assumptions, together with the emphasis on the qualitative approach, mean that conceptual categories and methodological distinctions are approached somewhat like tools in a toolbox. Depending on the specifics of the research situation, the scholar will select the most suitable approach and adjust and elaborate it for the purposes of the task at hand. In other words, methodology is treated as part of epistemology, as a part of human modelling activity of the other semiotic subject, object, or the environment, while any ontological claims are made very tentatively.

2. Basic methodological approaches in zoosemiotics

Zoosemiotics provides several basic methodological approaches for the semiotic study of animals: 1) analysing animal umwelten and environmental perception; 2) analysing biocommunication between animals; 3) analysing a given species' spatial organisation and use of space or landscape; 4) analysing animal representations in literature, art, film and other cultural media. In addition to these approaches, zoosemiotic methodology can be elaborated for the needs of specific research tasks (e.g. using umwelt theory dynamically for analysing the changing relations between animals and their environment), and for application in many other research topics (e.g. semiotic aspects of taming and socialisation [see Kiiroja, this volume]; the place of animals in philosophy [see Rattasepp, this volume]).

2.1. Umwelt analysis

Umwelt analysis is derived from the work of the Baltic-German biologist Jakob von Uexküll (Uexküll 1921, 1973[1928]; Uexküll, Kriszat 1934). Umwelt is one of his key theoretical concepts. It signifies the meaningful species-specific world in which the animal lives, acts and communicates. In other words, the umwelt is the sum total of all meaning-relations, or semiosis, of the given animal (for alternative definitions, see Sebeok 1989: 194; Hoffmeyer 1996: 54; Stjernfelt 2007: 226–227). One of the goals of the zoosemiotic research is to analyse which objects carry meaning for the animal, and what those meanings are in respective

communication or behavioural situations. Since researchers do not have the means to access the meanings of another species directly, indirect methods of study need to be applied for the description of meaning-relations in the umwelten of other species. One such methodological possibility is umwelt mapping, where knowledge about the animal's perceptual organs, body plan, ways of living, and ecology are taken into account for building hypotheses about the structure and contents of its umwelt (see e.g. Tønnessen 2014a; see also "Elaborating umwelt theory" later in this chapter). Umwelt mapping allows us to estimate which objects the animal can perceive and which of these are relevant for it functionally. It is also possible to map specific perceptual and effectual cycles, the so-called "functional cycles", that connect an animal with a specific environmental object, and thereby indicate as to what kinds of meaning-relations are obligatory for the given animal. Most straightforwardly, umwelt mapping can be based on the differentiation between the four basic functional cycles which, according to Uexküll, are related to food, enemies, medium/environment, and partners/sex (relations may also include symbiotic relations and relations between generations) (Uexküll 1973 [1928]; Uexküll, Kriszat 1934). These four basic functional cycles can also be used as a basis for the comparison of the umwelten of different species.

On the other hand, umwelt analysis can also entail participatory observation as a potential method. In this case, the researcher does not simply observe the behaviour and activity of another organism, but actively engages with the animal and sets up communicative situations for the other subject. Such methods are worth considering in the case of species that are socialised to the human community and whose umwelten are hence strongly entwined with the human one. Many species (pets, laboratory species) are also able to establish and participate in shared networks of communication with humans (cf. Lestel 2002). In such cases, communication with the animal can itself prove to be a valuable tool for investigating the sign usage and meanings of the animal.

Comparative or relation-based analyses of different umwelten allows for making estimations about how different animals relate to each other, and what the meaning of their characteristic features could be for each other. Examples of such umwelt analyses are found in Jakob von Uexküll's books *Streifzüge durch die Umwelten von Tieren und Menschen* [*A stroll through the worlds of animals and men*] (Uexküll, Kriszat 1934) and *Bedeutungslehre* [*Theory of meaning*] (Uexküll 1940). In one famous case, he analysed the umwelt of a tick encountering a mammal. As the first stage of the analysis, Uexküll determines the roles of the meaning receiver and the meaning carrier, explaining that every umwelt analysis should explicate these positions. Next, he describes the relations between the animals in the form of points and counterpoints by finding specific correspondences between their perceptual organs and signals or body structures. In the example of the tick, correspondences are found, for example, between the tick's olfactory perception and the butyric acid present in the animal's bodily secretion, between

the tick's tactile organ that allows it to navigate through the fur/hair of its prey and the presence of hair on mammals, etc. From these contrapuntal relations, Uexküll derives the meaningful rule that connects the subject with the environmental object or the other animal (in this case, the recognition of and attack on the prey, and the extraction of blood). In addition to the correspondence between perceptual organs and signals or body structures, the analysis could, in principle, also include physiological or behavioural correspondences or correspondences in the spatial and temporal activities of animals.

Uexküll's umwelt analysis can also be applied to determine the ways in which one and the same object can obtain different meanings in the animal's umwelt, depending on its development, stage of life, and motivation. In the case of insects that undergo full metamorphosis, the larvae have to follow entirely different environmental cues in comparison with adult insects. Uexküll gives an example of the pea-beetle larva, which eats a tunnel from the inside of a still-soft young pea to its surface. Once it has transformed into a pea-beetle, it exits the aged pea through that tunnel (Uexküll 1973 [1928]: 322; Uexküll, Kriszat 1934). Here we see how the meaning of the tunnel depends on the particular life cycle of the organism: at the larval stage, carving the tunnel to the surface serves as "food"; for the beetle, it becomes the "exit" (see also Linask *et al.* 2015).

Alternatively, an elaborated version of umwelt analysis can be used to map the variety of different meanings and functional cycles that different animals have with one and the same environmental object. Uexküll provides a simple example of how one and the same plant can be endowed with the meaning of picking, climbing, and eating, depending on whether the animal that approaches the plant is a human, an insect, or a cow (Uexküll 1940). Umwelt analysis can also be expanded to describe more complex relations between animals, as for example the threefold relations of mimicry (see Maran, this volume), or between animals and humans, as for example in cases where an animal may have senses, behaviours, or meaning-making capacities that are entirely absent in humans, yet where humans project their own specific umwelt into those of animals, irrespective of those differences. An example of this is the assessment of animals based on their having or lacking the capacity for language, self-reflection, consciousness, and so on. As such, umwelt analysis can be used as a critical tool for assessing the limitations of the human umwelt, and for a better understanding of the diversity of the forms of life. For further elaborations of umwelt theory, see also the section "Elaborating umwelt theory" later in this chapter.

2.2. Communication analysis

The second possibility for the zoosemiotic study of animals would be to focus on the communication process. Communication in different animal species differs to a considerable extent. On a purely physical level, organs of perception and

expression are different between species, and correspondingly, communication channels and ranges used in species and groups differ. For instance, insects predominantly use chemical communication; many birds and insects are able to perceive ultraviolet patterns; many reptiles sense infrared radiation; moths, bats and many rodents can use ultrasound; etc. Related to perceptual differences, organs of expression differ in different species as well. Specific body structures exist through which messages are expressed in animals, and which vary greatly (including outgrowths, spikes, outer ears, horns, feather structures, and tails, among others).

In addition to acknowledging the diversity of bodily structures and media used for communication, any analysis of specific cases of communication in animals should pay attention to the spatial or temporal organisation of the signals of a given species. Visual signals can form repertoires of behavioural acts with a communicative function, e.g., the facial gestures or body postures of many group-living birds and mammals. In temporal means, visual signals can form specific sequences of ritual behaviour – for example, "wedding dances" and other forms of courtship behaviour. In their full species-specific complexity, animal signals can be dynamically employed in dialogic or polylogic encounters between the members of one and the same or different species, and they can be described as conveying meaning or functions based on codes that organise specific acts of communication.

To study such diversity of animal communication, Thomas A. Sebeok (1990: 111–112) has proposed a zoosemiotic research platform comprising six questions concerning the different aspects of communication. In general, Sebeok's approach is based on the classical model of communication introduced by Shannon and Weaver (and as derived from the works of Roman Jakobson). To this model, Sebeok adds the concepts of message, code, and context, and describes four processes of transformation: in addition to coding and decoding, there are also the formulation and the interpretation of the message. His research platform approaches communication in the form of six questions, as follows:

1. How does an animal that acts as a sender formulate and code a message? Here one should pay attention to the bodily forms and the expression organs of animals, which allow for sending different types of messages. Formulating and coding the message is related to the question concerning the sender's intention and the need for communication: what is their function in its umwelt as related to its current motivations and intentions?
2. How are messages transferred, through what channel and under what circumstances? Different channels, such as visual, audible, chemical, and tactile, allow for different possibilities and have different effects upon messages. The use of communication channels may depend on the specific communicative task, and different channels may be combined for creating redundancy in communication.

3. How does an animal that acts as a receiver in the communicative situation decode and interpret the message? The possibilities and limits of the perceptual organs of various animals differ, and they may relate to the cognitive capacities and intentions of the sender in different ways. The success of the receiver in distinguishing the message from the noise may differ; it may be able to decode only part of the information that the message contains or, alternatively, interpret the message differently on the basis of the communicative context.
4. What is the possible repertoire of a specific species? This question may lead the researcher to describe the expressional possibilities of the given species in the form of a lexicon or ethograms. When describing the sign repertoire of a species, both synchronic and diachronic aspects, as well as messages belonging to distinct meaning categories, can be distinguished.
5. What are the properties of the code as used by a specific species? Sebeok here understands the concept of code to refer to a set of rules which are used to convert the message from one stage to another during communication. A code can be innate, learned over the course of life, or a combination of these, and in animal communication codes can also be related to environmental conditions.
6. What is the meaning (semantics) of the messages, and relatedly, what role does contextual information play in interpretation? In Roman Jakobson's model of linguistic communication, the referential dimension is associated with context. For example, the interpretation of messages can vary greatly, depending on whether the territory in which communication takes place belongs to the sender or the receiver, on whether it is an open or a closed and secure environment, and on other features. Meaning and context are also associated with the history of the communicative situation, both as evolutionary history and as earlier individual experience.

The semantic dimension in animal communication can be further analysed on the basis of questions such as what kind of biological functions or behavioural motivations do the communicative situations allow the animal to fulfill. In this respect, Günther Tembrock (1997) has distinguished the following functional types of animal semiosis: spatial semiosis (e.g. territorial calls and other behaviour related to territoriality), temporal semiosis (which organises diurnal and seasonal rhythms), semiosis of metabolism (related to foraging behaviours), protective semiosis (mimicry and other antipredatory communication), semiosis of explorative behaviour, and partner semiosis (communicative relations within groups but also between symbionts). The typology of meanings can be described in greater detail, but in such a case, distinctions would depend upon the specific object of study (for different possibilities, consider the chapters by Magnus and Tønnessen in this volume).

These six questions proposed by Thomas A. Sebeok provide a good starting point for an analysis and comparison of specific forms of animal communication. Nevertheless, it has to be taken into account that this approach is derived from

the classical transmissional model of communication, which has been criticised on various different grounds (fixating the positions of the sender and the receiver, presuming the sender's intentionality, etc.). Sebeok's research platform also appears to have limited applicability for describing communication between different species, where the shared code and repertoire are exceptions. For many research tasks, however, it remains a good heuristic device, one which also illustrates well the general logic of the semiotic approach in animal studies – that is, proposing a set of logically related study points or research questions and applying the set, as a toolbox, in order to achieve a systemic understanding of animals.

2.3. Environmental analysis

Zoosemiotics also provides theoretical tools for studying meaning attribution and usage of space by animals. The zoo biologist and semiotician Heini Hediger (1964: 7–18) has described the spatiality of animals by the use of the concept of *territory*, understood as a space that allows a member of a given species to fulfil its needs for food, water, movement, social contacts, and so on. Inside the territory, Hediger distinguished the *nest* and the *home range*, the latter being the area in which the animal usually moves, where it feels secure and what it protects from species mates. In addition, Hediger (1968) describes concentric spheres of distance that are characteristic of a species: social distance, personal distance, flight distance, and critical distance. These spheres are semiotic measures, as they are monitored and actively regulated by the animals. Social distance is the distance which is kept under normal circumstances by the individuals that belong to the same species and social group. Personal distance is the distance that is kept by individuals in pair relations. Flight distance is the distance from the animal body which, if crossed, is responded by the animal by a strong reaction of fear and an attempt to escape. In cases where escaping is not possible and the intruder approaches further, the critical distance is met and, once reached, animals (including peaceful herbivores) respond by attacking.

From the Uexküllian perspective, the territory of an animal can be described as being constituted by different patches and micro-niches, in which the animal fulfils its different needs or life functions (nesting, foraging, resting, guarding, etc.). Such meaningful patches in the landscape, described as *eco-fields* by the Italian landscape ecologist Almo Farina (Farina, Belgrano 2006), are dependent on both the physical shapes and structures of the landscape as well as on the perception and life functions of the given species. Farina defines the eco-field as a spatial configuration in the landscape that has a specific meaning for an animal in the case where its relevant life functions are active. Adopting the view of Uexküll, Farina describes *eco-fields* as "space configuration meaning carriers" (Farina 2006: 32). An organism's habitat usually includes various eco-fields that are active depending on the motivation, physiological state, or stage of life of the

given organism. This also means that, depending on the state of the organism, the landscape that the animal perceives and acts upon does not remain static but shifts in meaning. The species-specific cognitive landscape is the sum of all possible eco-fields, or meaningful spatial configurations.

In practice, the *eco-field* concept can function as a tool for describing the use of landscape by different species. Such an approach allows for the mapping of shared environmental resources for different species (for example, small passerine birds sharing the same forest), pinpointing areas in which different species can meet, and indicating the grounds for conflicting relations between different species. Eco-field analysis is also a suitable tool for analysing conflicts between humans and other animals stemming from the use of landscape resources. For example, commenting on the disappearance of the Iberian lynx (*Lynx pardinus*), Farina *et al.* (2005: 171) suggest that "an unprecedented spread of man-made barriers reduce connectivity between sub-populations preventing the explorative behaviour of such large organisms. The survivorship of the lynx is not a simple matter of prey biomass availability […] but is the result of the low score of different eco-fields that become rare in the Iberian region". Specific mapping can be used, for example, to analyse the conflicts between wolves, farmers, and sheep (cf. Tønnessen and Thibault, this volume).

Another example of a conflict that might be analysed in terms of eco-fields is connected to the Baltic coastal areas, where migrating barnacle geese perceive fields with newly sprouted grain plants as a place in which to refresh and nurture themselves along the long route. Farmers generally would like the grain to grow into maturation, in order to harvest and sell it. Feeding barnacle geese are perceived as a nuisance or 'natural catastrophe' whose deeds need to be reimbursed by the Ministry of Environment in the form of compensation for the unearned profit. Farmers are able to protect their fields from the big mammals walking along the ground by building fences, but it is much more difficult to stop birds coming from above. The habitual way of moving around (as a part of each respective species' umwelt) contributes to the development of conflict about different interests with regard to resource usage (cf. Farina 2012).

2.4. Analysis of animal representations

Zoosemiotics is also interested in cultural representations of animals, especially as related to human–animal relations and the semiosic capacities of the animals themselves. In this kind of research, it is first of all important to acknowledge that the meanings and positions of animals in any given culture or cultural artefact are manifold. They can be influenced by and reflect a specific cultural history, identity, religious backgrounds, social relations and contentions, specific cultural and economic practices with respect to animals, physical and semiosic properties of the animal species themselves, and so on (Tønnessen, Tüür, 2014). On the one

hand, animal representations can be thought of as reflecting on how a culture organises its relations with other living beings; on the other hand, representations may also serve various functions in the culture itself, such as aiding in memorising certain places, times, or events, identifying or characterising certain objects of culture, or building personal or social identities.

Cultural functions of animal representations as mediated in the wide array of human sign systems (such as text, song, dance, film, performance, ritual, etc.) serve a wide array of purposes. Animal representations can be used as a magic simile, a protective ritual gesture, a parable, a pedagogical example, or anecdotal evidence, to name just a few possible functions in human culture. Even the scientific representation of animals as sequences of statistical data is but a conventional way of making the animal phenomenon somehow intelligible to humans. At the same time, we should not expect to be able to perceive any animal "as it is", because our perception of both immediate and textual reality is conditioned by the limits and affordances of our human umwelt. The question "What is it like to be a bat?" (see Nagel 1974) calls for an emphatic approach, but it does not have an answer that we could actually judge as 'true' or 'false'. What should be remembered here is that we as members of the human species operate in our daily lives with representations of animals that are culturally and naturally conditioned – our cultural competence never leaves us in any encounter with other species, be it bodily or mediated.

In the most general sense, animal representations can be analysed along the lines of the distinction between denotative and connotative meanings, as described by Roland Barthes. Denotative meanings here expresses the relationship between the representation and the best knowledge available about the animal from biology, ecology, and common sense. Connotative meanings here expresses the relationship between representation and its cultural context. Invariably, in every specific case of animal depiction both aspects are present – some aspects are derived from what we know about the animal in its own ecological surroundings, and some aspects are derived from human cultural processes. For example, in popular nature documentaries, such as those made by the BBC or National Geographic, the postures and activities of animals are mostly authentic. The way in which the film is narrated, however, is the result of human storytelling, replete with many references to the human social order. On the other hand, even fictional works about animals, such as Felix Salten's book *Bambi, a Life in the Woods* (1928), have some biological basis. In this particular book, for example, the yearly life rhythm of the roe deer is depicted quite genuinely.

In this network of the manifold meanings of animal representations, there exists a specifically zoosemiotic aspect or research topic, namely attentiveness to the possibilities and means of animals to "influence" their own cultural representations or, in other words, how the semiosic activities of animals can motivate their representations. As remarked above, the zoosemiotic paradigm

does not treat animals merely as objects of human discourse, but also as subjects who are by themselves capable of initiating and shaping communicative relations. Zoosemiotics endows animals with the capacity to attribute meaning to environmental objects, to organise their environment meaningfully, and to participate in inter- and intraspecific communicative relations. Although umwelten of different species differ greatly, humans are also animals and thus are capable of making sense of other animals by different means (e.g. via the overlap of umwelten, using zoosemiotic modelling, analogy-based descriptions, etc.). Communication between humans and other species is often mediated through shared environments and joint activities. Such semiosic relations provide zoosemiotics with a methodological ground for studying the effects of the semiosic activities of animals on cultural texts.

At the same time, cultural convictions and textual representations of animals also influence how humans treat animals and shape human attitudes toward animals in areas such as nature protection, hunting, tourism, etc. (cf. Mäekivi, Maran 2016). In particular, public attitudes toward wild carnivores, foreign and invasive species, and pets depend considerably on cultural communication. The semiotic influence of animals on culture, and human understanding of and behaviour toward animals and their natural environment, appear to form a reciprocal relationship.

In the context of this reciprocal communication, zoosemiotics can inquire as to how culture as reflected in different mediums and artefacts represents the semiotic nature of other animals, their meaning relations with the environment, and communication in animals themselves and with humans. In the case of literature, one may enquire, for example, to what extent the author has paid attention to the perceptual and expressive capacities of the specific species, and how have they been able to express these. It is also important to enquire as to what extent the animal is allowed to act as a subject in the text by being an active participant in it and shaping the course of events. For example, is the animal protagonist endowed with the capacity to expresses itself (verbally), and are its utterances in accordance with the behavioural logic of its species? Zoosemiotics may also study the role of animals as motivators or inspirers of the literary creation. In nature writing, numerous essays relate back to the specific animal encounter. To provide an example, a fatal meeting with a wolf becomes a triggering motive for one central text in environmental philosophy: Aldo Leopold's (1949 [1968]) "Thinking like a mountain". In this essay, a personal encounter leads the author to the understanding that even a wolf pack has essential value as long as our point of view is broad enough to embrace the ecosystem as a whole. Further methodological possibilities of zoosemiotic studies of animal representation lie in analysing the position of the subjective character of an animal in relation to the manifold cultural connotations mentioned above: what is the position of animal subjectivity in narrative and discourse, and how it strengthens or conflicts with other textual meanings.

The ways in which animals influence human representation and interpretation of them in cultural texts are manifold. The diversity of representations of animals in human culture can be explained with the help of the notion of *the nature-text* (Maran 2007). In brief, "nature-text" denotes a set of physically justified associations of meaning between the natural environment and its textual representation. These associations may appear as structural correspondences, may be related to the perceived modalities and the intensity of experience, may stem from the particular senses that are used in establishing contact with the represented reality, and may be related to the textual mediator's mental states that have a biological basis, such as fury or joy. In addition, the reader's experience plays a role in making sense of the cultural representation of the particular natural phenomenon. It may also affect the described environment/animal in the case of a non-mediated encounter with humans. The original introduction of the concept points out that the nature-text is characterised by locality: the inevitable connection of the text with its model environment. In the case of animal representations, a similar question about 'organic' similarities between humans and animals arises.

In broad strokes, each living being has a certain life-cycle that is framed by birth (or hatching) and death, and it generally includes activities of procreation, searching for food, hiding from predators, and avoiding pain (cf. Uexküll's four basic functional cycles). As such, the temporal organisation of the life of an animal may inform the narrative, as is often the case with nature documentaries. An interesting example of a text guided by its subjects' umwelt is the Finnish writer Leena Krohn's fantasy book *Tainaron – Mail from Another City* (1985; English translation 2004) about life in an insect city, in which the narrative structure is thoroughly conditioned by the life cycles and habits of various insects.

Many other phenomena among animals may have an effect upon the structure of the text. Some species, particularly songbirds, have songs and calls that are aesthetically pleasing or are remarkable in other ways. The simplest example of the aesthetic representation of bird songs is their rendering by means of onomatopoetic words. The particular time of day when it is most probable to see or hear a bird often determines the starting point of its depiction. The dynamics of the aesthetically pleasing activities of a species often informs the temporal structure of the text in general. At the same time, it is a human value judgment as to which instances of an animal's life are worthy of representation, of being embedded in the texts of human culture.

3. Modelling theory

Modelling theory is a valuable source for zoosemiotics as both a means for the human observer to reach the research object and as a possibility for making sense of the meaning processes of other species. Models and modelling are broad concepts that allow us to treat human and nonhuman semiotic activities within the same theoretical framework (Sebeok, Danesi 2000). Thomas A. Sebeok derived his understanding of a model from Uexküll's concept of umwelt and argued that all living beings that have umwelten also model their surroundings. The complexity of modelling differs among various species. For example, only humans are capable of using linguistic means for creating models. Modelling allows us to distinguish and map the semiotic competence of organisms based on the hierarchical complexity of their modelling processes. It also enables us to demonstrate how the process of making sense of the material environment itself leads to its change as models are created in relation to the object, while yet retaining the analogy-based linkage that can later be applied back to the object.

For the present purposes, modelling is taken in a relatively broad way as an activity of making sense of some process or phenomenon with the help of (internal or external) representations that are at least partially based on analogies. Sebeok and Marcel Danesi define modelling as the use of forms for comprehending and processing perceived information in a species-specific way (2000: 5–6). Ladislav Tondl adds that a "model is able to substitute for the original [… and] permits some important functions of decision-making or evaluations concerning the original" (Tondl 2000: 85). Models can include analogy-based representations of different complexities: from prototype-based categorical perception and conditioned associations in nonhuman animals to the anthropomorphic descriptions and mathematical models of human discourses. As an example, we can consider a migratory bird's mental map, which incorporates innate and experiential knowledge, the image of certain landmarks, and the position of the sun and the constellations, among other sources of environmental information; this mental map constitutes a model of its migratory route. The representations that are created in the course of modelling can remain internal (in the case of mental associations) or can be externalised (writing, artistic works, and other forms of human modelling).

Humans are capable of carrying out several layers and types of modelling. According to Sebeok, humans share with other animals the activity of "zoosemiotic modelling", a kind of modelling in which signs are distinguished by the organism's species-specific sensory apparatus and are aligned with their behavioural resources and motor events (Sebeok 1991: 54). The basic associations in the umwelten of animals (for example, between signs in the terrain and movement, or between signs of food and consumption) possibly form the universal ground for modelling in animals. We can also think of the processes of recognition and mapping that take place in our immune system and in other centres of biosemiotic competence in our body, such as the peripheral nervous system or the endocrine system, as

forms of unconscious modelling activity. Verbal modelling is a unique capacity of the human species, and it may lead to higher, poetic, artistic, ideological, or religious forms of modelling, denoted as "secondary modeling systems" by the Tartu-Moscow semiotic school (Lotman 1967: 131). Sebeok and Marcel Danesi (2000) propose a further typology of different modelling types: singularised modelling (sign-based), composite modelling (text-based), cohesive modelling (code-based), and connective (metaphoric) modelling.

A relevant feature of modelling is that a model represents an object not in all of its aspects, but only in a certain respect, and the specifics of this relation itself have semiotic significance and meaning. "The model represents a homomorphic representation, i.e. not identical to the original. It means the representation in the sense of the Latin 'pars pro toto,' the part instead of the whole" (Tondl 2000: 83). It is in this very relation between the original and the model that the specifics of the species, the umwelt, the language, the cultural tradition, the discipline, etc. of the interpreter become involved and make the difference. This specificity of modelling is an important aspect of zoosemiotic analysis for understanding the object, e.g. the psychological motivation of the communicating animal, the discursive strategies and descriptive frames used in cultural representations of animals, and the presumptions and inclinations of zoosemiotics itself, attended to by means of auto-communicative reflection.

In humans, the basis that has been used to establish the relationship between the object and the model can also be used to distinguish a number of metaphoric ascriptions of different levels – the so-called morphisms. The Czech historian of science and philosopher Stanislav Komárek has proposed a typology of such morphisms, including biomorphism, technomorphism, and sociomorphism (Komárek 2009: 108ff). In biomorphism, meaning transmission is based on the general characteristics of living beings; in technomorphism, the world or any entity within it is described by emphasising its machinelike properties; in sociomorphism, human society, culture, and economics are taken as the measure with which to describe the rest of nature. By using different morphisms, humans are able to model matter as alive, humans as machines, machines as pets, nonhuman animals as humans, and so on.

Among analogy-based modelling strategies, anthropomorphism is the most widely studied and criticised. Instead of a careless criticism of antropomorphism, zoosemiotics would rather consider its different forms as relevant objects of study. Morphisms allow humans to comprehend things that are partially unknown to us, based on their analogies to things that are more common. We can, for example, use humans or other living organisms as a basis for metaphoric ascription to make better sense of material processes, or to give to these processes a human or at least an animate dimension. In a broader sense, zoosemioticians understand analogy-based modelling strategies as an important and often inevitable part of the research activity. Here zoosemiotics can follow the lead of

the cognitive ethologist Gordon Burghardt (2007), who has turned a version of anthropomorphism into a scientific method. His "critical anthropomorphism" treats anthropomorphic description as widely existing or even inevitable, and calls for the critical examination of both similarities and differences of communicative and cognitive skills between humans and animals in the framework of Uexküll's umwelt theory. Such an analysis would expose the cognitive mechanisms that humans use for making sense of other animals, and thereby lead to a better understanding of the animals themselves.

4. Elaborating umwelt theory

As has been often noted, Jakob von Uexküll's umwelt theory is an essential source of inspiration for the zoosemiotic research program. However, in order to be applicable to different cases where animals, humans, environment and culture interact in complex ways, the umwelt theory would require some elaboration. There are at least four significant theoretical problems with umwelt theory: (1) What Brentari in his recent book *Jakob von Uexküll: The Discovery of the Umwelt Between Biosemiotics and Theoretical Biology* (2015) calls "the Kantian problem", (2) Uexküll's idea of perfect harmony in the relation between organism and environment, (3) umwelt theory's relation, historically, to animal psychology, and (4) Uexküll's political use of umwelt theory (for an overview of the central criticism of umwelt theory on these points, see Tønnessen 2015b: 9–12). Such problems must be dealt with if we want to apply umwelt theory in today's scientific and ecological context. As Brentari (2015: 241) aptly states, Uexküll's work (and, implicitly, an updated umwelt theory) can be of great use in conservation biology because it shows us how preserving biodiversity implies protecting "the semiotic, perceptive and operative worlds in which life unfolds".

Morten Tønnessen has recently proposed several ways to elaborate umwelt theory, which can be summarised in 10 points, as presented below. In several of these, new concepts are introduced, as well as the occasional model and figure. These elaborations of umwelt theory are either claimed to be consistent with Uexküll's original thought, or to be necessary given an updated scientific and philosophical understanding of the subject matter.

The first elaborations concern the relation between subject and world, which are fundamental in Uexküllian thinking, given his programme for a subjective biology.

1. *Uexküllian phenomenology* derives from the umwelt theory of Uexküll, and represents a genuine, unique perspective within phenomenology. Uexküllian phenomenology "is characterised by an assumption of the (in the realm of life) universal existence of a genuine first person perspective, i.e., of experienced worlds"

(Tønnessen 2011d: 35), and it is "an example of – a special case of – a *semiotics of being*, taken to be a study of signs designed so as to emphasise the reality of the phenomena of the living" (*ibid.*; see also Tønnessen 2010, 2011b, 2011c).

2. "The *ontological niche* of a being can be defined as the set of contrapuntal relations that it takes part in at a given point of natural history. The ontological niche of a being delimits the 'area' that this being occupies in the phenomenal world" (Tønnessen 2003: 288, emphasis added). Human ecology can be studied in terms of the human ontological niche (cf. also Tønnessen 2011a).

The next couple of developments of umwelt theory concern the complexity of umwelten or their intertangled nature.

3. Not all umwelten are *species-specific* (i.e., applicable at the level of the species). In many cases, it is meaningful to refer to lower-level umwelten, such as individual and population umwelten, as well as higher-level umwelten, such as for example the mammalian umwelt.[1] With the exception of individual umwelten, both higher- and lower-level umwelten can be described with an emphasis on whatever characteristics are shared within the group in question.

4. Not all umwelten can be meaningfully studied in isolation from other umwelten. An *umwelt assemblage* can be "defined as the assemblage of two or more umwelten of creatures acting as one – e.g., the synchronised behaviour and perception of a rider and a horse" (Tønnessen 2014a: 162). *Swarm umwelten*, a special case of umwelt assemblages – for example the umwelt(en) of a school of fish, or of a flock of birds – rely heavily on *umwelt alignment,* which is "the process of adjustment by one creature to the presence and manifestation of other umwelt creatures (and further, to abiotic umwelt objects and meaning factors)" (*ibid.*, 162–163).

The following elaborations concern the temporality of umwelten.

5. Umwelten are not static. An *umwelt transition* can be defined "as a lasting, systematic change, within the life cycle of a being, considered from an ontogenetic (individual), phylogenetic (population-, species-) or cultural perspective, from one typical appearance of its umwelt to another. An umwelt transition, in other words, can be regular, irregular or a singular, extraordinary event" (Tønnessen 2009: 49). Umwelt transitions occur in evolution, in ecological developments (including those of an anthropogenic nature), in the development of individual organisms, in culture, and in individual lives.

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[1] In the human context, Uexküll referred, for example, to the umwelten of different professions (*Berufsumwelten*), cf. Uexküll 1910: 126. For a critique of Thomas Sebeok's portrayal of the umwelt as species-specific, see Tønnessen 2011d: 19–20. See also Tønnessen 2003: 288–289.

6. In many cases, it makes sense to refer to the umwelten of different life stages, or to acknowledge that species-specific developmental patterns determine the character of the umwelt generally. In mammals and birds, we can distinguish between *altricial umwelten* and *precocial umwelten*. "[W]hereas precocial umwelten are largely functional from the outset, a[l]tricial umwelten become fully functional only gradually" (Tønnessen 2014b: 282). At an earlier stage of ontogeny, we can identify a transition in the development of all sentient umwelt creatures from a simple *embryonic umwelt* to a *sense-saturated umwelt* (*ibid*., 291–294).

7. An *umwelt trajectory* "can be characterised as the course through micro- or macro-evolutionary (or cultural) time taken by the Umwelt of a creature, as defined by its changing relations with the Umwelten of other creatures" (Tønnessen 2014a: 161). The concept of an umwelt trajectory represents "an aggregate, collective (and evolutionary) equivalent of Uexküll's notion of the *Umwelt-tunnel* of a single individual creature" (*ibid*., emphasis added). *Umwelt futurology*, the study of future umwelten, involves studies of the future which make use of umwelt modelling and methodology (*ibid*., 175–178).

Finally, the concluding elaborations of umwelt theory concern theoretical and methodological tools or perspectives.

8. *Umwelt mapping* can be understood simply as mapping – systematically describing – the umwelt of a specific living being (see Tønnessen 2010: 388–390, 2011d: 40–48 and 2015b: 15–19). Umwelt mapping can also be understood as mapping of *ontological niches* (cf. pt. 2). An *ontological map* (Tønnessen 2011a, 101–104), a subjective ethogram of sorts, represents the significant relations of an umwelt creature. "Each ontological map depicts significant relations of a creature qua individual, or population, or species, and so forth, in a more or less idealised way. The procedure is a) to identify significant others and b) to determine the functional tones of their relations to the Umwelt being at hand" (Tønnessen 2010: 388).

9. The *tripartite umwelt model* makes it possible to distinguish between "Umwelt objects as *encountered*, Umwelt objects as *anticipated* and Umwelt objects as *conceptualised*" (Tønnessen 2011d: 37). According to this model of complex umwelten (*ibid*., 78–82), there are three aspects or layers of umwelt, namely 1) the *core umwelt*, 2) the *mediated umwelt* and 3) the *conceptual umwelt*. Only animals with a central nervous system (i.e. sentient animals with a sense-saturated umwelt) have conceptual umwelten. The umwelten of simpler organisms have only two aspects, namely the core and the mediated umwelt. The model has been developed further, for example, in Tønnessen 2015a, and for its use in umwelt futurology (cf. pt. 7), see Tønnessen 2014a.

10. An *umwelt ethics* (of which there might be several versions, involving different normative stands) is "an ethics that rests heavily on fundamental features of Jakob von Uexküll's Umwelt theory" (Tønnessen 2003: 281). "The reason why it makes sense to regard all semiotic agents [...] as moral subjects", according to this specific umwelt theory, "is that in respect to these entities, our actions make a difference. Only for semiotic agents can our actions ultimately appear as signs that influence their well-being" (*ibid*., 292; see also Beever and Tønnessen 2013). Relatedly, *biosemiotic ethics* (Beever 2011) suggests that semiotic agency is a morally relevant property (Tønnessen and Beever 2014).[2]

5. Hybrid objects and ad-hoc methods

Many objects of zoosemiotic research appear to have a hybrid nature; that is, they contain both cultural and biological processes. In this context, to be a hybrid means that it is not possible to place the object entirely into a single domain of knowledge; rather, it surpasses the boundaries of the different spheres of human activity and scientific disciplines. In zoological gardens, in the behaviour of guide dogs, in the discourse of invasive species, and in other objects, biosemiotic and cultural semiotic processes are intertwined in myriad complex ways. The concept "hybrid" derives from the work of the French sociologist of science Bruno Latour, who used it to conceptualise the phenomena that overcome or problematise the central distinctions of the modern episteme between culture and nature, human and animal, description and the objective world. Hybrid, in this sense, is the blend or mixture of different spheres or processes of the world. Latour introduced this concept in his book *We Have Never Been Modern* (1993), and has subsequently developed it throughout many of his publications.

In this subchapter, we would like to turn our attention to the semiotic aspects of hybrids and their relation to semiotic methodologies. One possibility of describing hybrid objects from the semiotic perspective would be to argue that they are objects that partially remain outside of the describing culture and that, for this reason, they are partially out of reach for the possible metalanguages of the culture. This is indeed true of most zoosemiotic objects. At the same time, this indescribable part appears to greatly influence those parts that are accessible for description in the culture. In this respect, the common structuralist approaches that attempt to delimit and describe that part of the object that is accessible by cultural means would result in partial and inaccurate results. Approaches characteristic of the biological sciences tend, on the other hand, to undervalue the relationship between the object and the cultural context of the researcher.

[2] For a review of biosemiotic understanding of agency in general, see Tønnessen 2015a.

Biosemiotics and its subfields appear to be especially rich in hybrid objects. The common feature of hybrid objects is that they transcend certain epistemic divides. For example, hybrids can emerge:

a) in communicative relations between humans and other animals, where the umwelten of different species interact and new communication codes emerge. Such objects would belong to be the scope of zoosemiotic studies.
b) between human culture and the internal endosemiotic organisation of the human body. Examples of this dimension are the different conditions of the organism, such as illnesses, sexuality, motherhood, etc., and their reflections and representations in culture.
c) between human culture and the natural environment in the form of semi-natural environments, traditional agriculture, nature writing, etc. This would constitute the traditional sphere of ecosemiotic research.

Many objects of zoosemiotic research go beyond or problematise the culture-nature divide, and this brings along the need for particular kinds of epistemological approaches, methodologies, and research tools. In general, practical research of hybrid objects appears to underline the importance of open epistemologies and ad-hoc approaches.

"Ad-hoc" as a scientific concept is derived from the philosophical works of Imre Lakatos and represents an important mechanism of the scientific change. In cultural semiotics, ad-hoc theories and methodologies have been propagated by the leading scholar of Tartu semiotics, Peeter Torop, who sees ad-hoc approaches as being attentive to the specifics of the complex research object: "Culture as an object of analysis often dictates its analysability, and therefore ad-hoc theories as object-based theories have a special place in the disciplines that study culture" (Torop 2009: 38). Further, "it is important for the researcher to address the research object in the right way. This creates a basis for fruitful discussions and competent analysis" (Torop 2011: 59). Torop treats ad-hoc approaches as particularly important in the context of cultural semiotics, but we argue that they are more generally suitable for studying semiotic objects, including hybrid zoosemiotic objects. Ad-hoc methodologies are suitable in cases where the object is considered to be complex, bringing along its own semiotical dynamics. In this context, it is relevant to point out the organismal metaphors (e.g. membranes and the spatial organisation of the semiosphere, Lotman 2005; "text as being alive", Kull 2002) as used in the Tartu semiotic school.

In general, ad-hoc analysis is a method of description that is created on the basis of a specific research problem. On a more general level, ad-hoc methods rely on an open epistemology, understood as a critical approach towards the concepts applied and the distinctions made that are considered conditional, temporary, and not fully corresponding to the specifics of the object. This is related to the distinction, proposed by Torop, between the high and low level of control in research. He writes:

> High level of control refers to research conducted on the basis of a fixed theory or concepts and the metalanguages that support this theory. Low level of control refers to ad-hoc analyses that try to deduce the analysability and the suitable metalanguage on the basis of the specifics of the research object. (Torop 2009: 28)

The open epistemological stance would also mean that distinctions and typologies made at the beginning of the study need to made carefully and with the consideration that the object may bring along its own structuring, sign systems, and sign activity. In addition, the research methods and models should leave room for taking into consideration the principally unknown aspects of the hybrid object.

The conceptual framework suitable for studying hybrid objects should preferably be relatively simple. This is for the reason that we must take into account the possibility that the metalanguage and the object language (or the semiotic structure of the object under study) may not suit each other well or be even conflicting. In the case of hybrid objects and zoosemiotics, the challenge appears rather to be in keeping the metalanguage relatively simple and open to the influence of the object, to include the conceptual means for addressing the processes and features that are unknown. In both cases, however, the metalanguage should be adjustable over the course of the research project as a result of the dialogue between the object and the investigator.

6. Closing remarks

These methodological considerations on modelling theory, umwelt analysis and hybrid objects remain underlying principles and need to be adjusted according to the nature of specific research objects and situations. The practical use of these research methods and concepts are demonstrated in the chapters that follow, focusing on case studies in zoosemiotics.

Acknowledgements

The research for this chapter was supported by the institutional research grant IUT02-44 from the Estonian Research Council and by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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The philosophical discourse on animals, and the philosophical animals themselves

Silver Rattasepp

Today, animal studies and related fields, such as posthumanism, multispecies ethnography and the like, are blooming. It is often said that we are now undergoing an "animal turn" or perhaps even a "species turn", as suggested by Kirksey and Helmreich (2010). This latter "turn" was coined in order to accommodate newer and more encompassing works that are not limited to animals only (e.g. Kohn 2013; Cohen 2012; Marder 2013). Analyses of animals proliferate in any number of fields in the humanities and social sciences, and in interdisciplinary works and journals. However, philosophy has, in general and in broad strokes but admittedly with a few notable exceptions, not followed this new trend. In fact, as argued below, philosophy has seldom had much of interest to say about living beings other than humans, and even there it steadfastly avoids anything that would smack of the biological, of the animal. Ever since Socrates declared that it is the men who dwell in the city who are his teachers and not the trees in the countryside, animals have been thought of, at best, as poor in world.

What follows is not, however, a survey of philosophical tracts and their commentary on animals. Such work is well underway elsewhere (e.g. Oliver 2009; Lippitt 2000; Calarco 2008; Lurz 2009; etc.). Instead, the chapter is divided into two parts: the first lays down the basic structure by which animals are expelled from philosophy, and the second part tells certain admittedly fanciful stories about what an "animal gaze" at human theorisers would look like.

A claim was made above that the conjunction of philosophy and animals is lacking to the point of being non-existent. This claim is bound to sound ludicrous to many, since even cursory readings of philosophy will reveal that there are, in fact, menageries of animals in philosophy. This point should therefore be clarified. What philosophy lacks is not discussion of animals, but rather discussions of animals where they would appear as living representatives of nonhuman modes of being, of alterity, of a life that is not human. Animals appear as symbols, tokens, figures and exemplars, but not as concrete individual species whose externally observable traits and behaviours could provide philosophical insights, nor as particular subjects representing life-worlds differing from those of human beings. It is to the reasons of this expulsion of animals that we now turn.

1. Structure

Generally speaking, animals take on one of a few generic forms in philosophy. (1) They are nonspecific placeholders in that the concrete, chosen animal is interchangeable, such that any one species is as good as another to be used as an example. (2) They are used as codes or metaphors awaiting interpretation, in that behind the animal lurks a general philosophical idea which must be found or revealed. (3) They are creatures who can be entirely described by a reference to a human capacity that the animals themselves lack, for which reason no species-specific knowledge of them is required, since this reference to a human capacity that they lack is sufficient. This latter "use" of animals is analysed below; for the other two uses, see the extended discussion in Tom Tyler's *Ciferae* (2012). In short, nonhuman animals are not actually there in philosophy as concrete creatures in their own right. Rather, animals derive their meaning from their application in or reference to some other, entirely unrelated endeavour.

The most common form of discussing animals and animality in philosophy is to note and mark their collective lack of some human characteristic. In fact, the general way of addressing animals in philosophy is barely distinguishable from the common sense discourse on animals, the basic formula of which is "humans are distinct from animals due to some characteristic X". The purpose of this formula is, of course, to find one singular dividing line that would help us place all animals, *in toto*, to one side, and all humans as completely separate and exceptional on the other. For in humanist philosophies, the realisation of human identity is thought of as "a process of purification and of separation, the peeling off of extraneous layers of in order to reach an identity at the depth" (Marchesini 2010: 92). To talk about animals is, in philosophy, to talk about human uniqueness.

Moreover, animals – or rather animals as convenient examples, for ethology is seldom of any interest to philosophers – are used to add "rhetorical force to their descriptions of distinctive qualities of the human" (Oliver 2009: 10). In their texts, "philosophers dissect, probe, exploit, and domesticate animals to shore up their notions of human and humanity [...] they turn wild animal metaphors into domesticated beasts of burden to prove their theories about man" (Oliver 2009: 12–13). The result of this self-centred perspective is that attention to the vast diversity of life was, up until very recently, nearly absent in philosophical thought.

The common formula that "humans are distinguished from animals because X" can, of course, be further explicated. There are at least six dimensions to it, not all of them present in every text, of course, at least not explicitly. Taken together, however, they form a set of interlinked lines of thinking, the consequence of which is to expel animals from philosophy as unworthy of interlocution, and thereby to reassure us of human uniqueness and exceptionality. These six lines of thought are as follows:

1. The identity of the human, that is, uniquely human nature, is determined by a circularity, even a tautology: by looking only at themselves, humans decide

that human identity or nature can be determined entirely by studying humans. This applies to most supposed basic determinants of human nature, such as language. In fact, as Lippitt notes, "The economy of human subjectivity and speech is restricted: only human beings are capable of speech, which, in turn, founds the human subject. Animals enter that tautology as a phantasmatic counterpoint to human language" (2000: 15). This point will be examined further below.

2. On the basis of this decision, those traits or characteristics that are uniquely human, namely those that all animals lack, will be determined with no room for species-specific divisions. If an animal species has something unique that humans do not have, then they are merely different; if humans have something that no other animal has, they are unique. In this perspective, comparisons between nonhuman animals themselves are irrelevant; comparing the evolutionary distance between some nonhuman animals is not of interest for this decision. (Cf. Ingold 1990: 210 for a more thorough discussion of this point.)
3. The distinguishing trait that separates humans from animals and makes them unique is found to be something related to some purportedly mental capacity, such as language, consciousness, rationality, etc. If a trait or property does not seem, at first blush, to be related to mental capacity, it will be reinterpreted as such. This is the case, for example, with bipedalism and opposable thumbs, which would remain merely of biological interest until they are recast as opening up the capacity for tool-making and construction, that is, the reshaping of matter based on human mental conceptions. Other uniquely human traits that cannot be so recast – such as contagion by uniquely human parasites, for example – are of no interest to such a philosophy.
4. Related to the above points, the treatment of animals will be a negative mirror image of human uniqueness. Animals are describable entirely by their lack of what is supposedly uniquely human. At minimum, they lack the same degree of development of said property. It should be obvious that in such thinking no animal species is characterised by a level of development of a human trait that would be the same or even higher than the one found in humans. Other animals either entirely lack said trait (language, self-awareness, reason), or they have "lower", rudimentary forms of those traits (e.g. a capacity for some forms of communication, but not for symbolic sign use).
5. In most cases, animals are treated in the singular: not as the diversity of life comprised of a plenitude of species, but as simply "animals". The purpose of "animals" in the singular is to provide a background from which human uniqueness can stand out. As Marchesini puts it, this sort of thinking "creates a horizon of the non-human that is characterised by universality, which is considered to be neither a multiplicity not a bearer of individual characteristics, as opposed to the category of humanity which is intrinsically pluralistic" (Marchesini 2010: 93).

6. Yet despite all of the above, animals still hold a fascination for humans, and often inspire fear. As such, to determine human uniqueness often does not amount to a mere denial of some traits to humans, but to an expulsion or overcoming of the supposedly animal and bestial. In the most forceful version of this thinking, to understand what is "man" is to *expel* the animal. "The effort to define the human being has usually required a preliminary gesture of exclusion: a rhetorical animal sacrifice. The presence of the animal must first be extinguished for the human being to appear" (Lippitt 2000: 8). In fact, the ascent of mankind from the order of nature is a basic theme in philosophical thinking. This can be achieved by ascertaining (by humans and *in* humans) all "animal" or "bestial" aspects, "by isolating the nonhuman within the human" (Agamben 2004: 37). This would help one to sieve out everything "truly human" so that the nonhuman bestiality in the human could be excluded, expelled or overcome: "Anthropogenesis is what results from the caesura and articulation between human and animal. This caesura passes first of all within man" (Agamben 2004: 79).

2. Consequences

It is at this point where we can draw the difference between the schema of the knowing subject relied on by the various forms of humanism, including the exclusionary philosophy described above, and an attempt at the rethinking of that schema, to be found in animal studies and the so-called posthumanities. On the face of it, the distinction is relatively simple; it amounts to an integration of otherness, which includes nonhuman animals as opposed to the purging of the nonhuman, which may also include forms of the non- or inhuman, such as technology, AI, and the like.

Michel Foucault famously begins his *The Order of Things* with a nonsensical-sounding list of descriptions of animals that seems to lack any coherence and systematicity (Foucault 2002: xvi). I will not repeat the list itself here, as it has been repeated enough. We should proceed, however, from Foucault's point that the reason for the confusion is its lack of any explanatory framework or a ground that would help us perceive (in the motley abundance of the world) a certain kind of unity, without which we would be cast into a world full of sound and fury, signifying nothing. In the human sciences, however, this foundation has long been found: to unify in a system and to make coherent our perception of the world, we must cast our eyes to "man" and his ways of signifying, representing, discoursing, thinking: "Man [...] is a strange empirico-transcendental doublet, since he is a being such that knowledge will be attained in him of what renders all knowledge possible" (Foucault 2002: 347). In the human sciences, it is the human being who is the locus of both the condition of possibility of knowledge and the object of that same knowledge; both the object of study, and the conditions

of possibility of that very same study, are to be found from the human beings themselves. "Man" finds in himself knowledge that makes knowledge possible, in whom reside all those things that make knowledge comprehensible and systematic. In the course of philosophical thought, many of these conditions of the possibility of knowledge have been named, but in the end, and as already noted above, they all look similar, being reductions to the human mind: language, reason, rationality, symbolic signification, consciousness, intentionality, discourse, culture, and so on.

It is a curious and, I should add, a very animal situation! For nonhuman animals, too, mark their territory with whatever their body is able to exude, be it with a scent, with excrement, with noises, and so on. And Massimo Filippi has provided an analysis of just this kind of territorial behaviour in human animals. As he notes,

> the common practice humans and other animals use to acquire the *property* of what is beyond their bodies – and therefore not immediately their own – consists of marking it, branding it, with their own *physical traces*. (Filippi 2011: 50–51)

Like the animals that that they are, humans also use their own symbolic scent to mark their territory, mostly with the help of representations: for the empirico-transcendental doublet, the appropriation of the world is made possible through a kind of "semiotic contamination" (Filippi 2011: 52), which is used to appropriate the world in order to domesticate it into a human representation. The result is a world-wide impoverishment, as Baudrillard so well admonishes:

> Behind every reflection, every resemblance, every representation, a defeated enemy lies concealed. The Other vanquished, and condemned merely to be the Same [...] Every representation is a servile image, the ghost of a once sovereign being whose singularity has been obliterated. (Baudrillard 1996: 149)

But all this no longer works, for alterity has begun to reveal its diversity and has become unresponsive to every attempt at compression into a single category opposed to humanity (Marchesini 2010: 93). As such,

> It is *not just* a matter of asking whether one has the right to refuse the animal such and such a power [...] It also means asking whether what calls itself human has the right rigorously to attribute to man, which means therefore to attribute to himself, what he refuses the animal, and whether he can ever possess the *pure, rigorous, indivisible* concept, as such, of that attribution. (Derrida 2008: 135)

What is proposed here is, then, to take as if a circular or circuitous look back at human identities, societies, and ideas through the metaphorical eyes of

the nonhumans. It is a question asked with the gaze of the nonhumans, first, whether what humanist philosophies have attributed to humans does indeed give rise to that solitary and isolated human subjectivity or human being in general, and then, second, to see how human societies, subjectivities and cultures are constituted by a network of relations, most of which cannot be said to be "human" in any straightforward sense (for this, see Wolfe 2010, particularly p. 49ff). Our embeddedness in environments that are full of myriad nonhumans with whom our lives are inextricably connected, our evolutionary background, and the external prosthetics of languages and cultural patterns, lay down the foundation of the human who, as such, is fundamentally nonhuman. "What is proper to man is never pure; it does not belong to him/her as a private property" (Filippi 2011: 57). The human is nonhuman – *that* should be one of the slogans of future humanities.

This conception has certain consequences for humanist philosophies. For it appears that such a process is already taking place: ever more new subjectivities are incorporated into thought, the scholar of the humanities incorporates into his purview ever new areas and topics of study. This is exemplified by all the myriad "turns", all the various "X studies", from cognition to animals to ontologies. Yet as Cary Wolfe has claimed, this nevertheless leaves unquestioned the premises and the logic of the subject who does the incorporating, and consequently hidden under this gesture of emancipation, of the inclusion of previously neglected objects and subjects, there is a gesture of homogenisation, of standardisation. For

> just because we study nonhuman animals does not mean that we are not continuing to be humanist – and therefore, by definition, anthropocentric. Indeed, one of the hallmarks of humanism is precisely its penchant for the sort of "pluralism" that extends the sphere of consideration to previously marginalized groups without in the least destabilizing or throwing into question the schema of the human who undertakes such pluralization. (Wolfe 2010: 99)

The empirico-transcendental doublet merely extends itself, repackaging its own historically, ideologically, and intellectually specific form of subjectivity into an emancipated pluralism – it extends itself with a gesture of benevolence, but does not question *itself*.

The core issue at this junction is a matter of extension as opposed to attribution. The scholarly disciplines that are underpinned by the humanism of the doublet *extend* themselves *over* new and previously neglected objects and topics of study – hence the constant drive to find ever new topics, themes, and avenues of research to which their gaze can turn, and the proliferation of endless novel "turns". Yet they seldom *attribute* their own characteristics to those whom they study: how often is the humanist doublet itself an object under scrutiny by others? How often is the possibility acknowledged that whatever characterises

their object or topic of study could have something that could be either *attributed* or *extended* to themselves? This has been especially prevalent as far as philosophical speculations about nonhumans, especially nonhuman animals, are concerned. In addition to the refusal of attributing language, thinking and reasoning to nonhumans, other examples are easy to find, such as the criticism of anthropomorphism as the root of evil in animal studies. Yet even here we already find the breaking down of humanism, as exemplified by novel ways of thinking, such as critical anthropomorphism, representing an attempt of overcoming what Rivas and Burghardt have called "anthropomorphism by omission", which is the "failure to consider that other animals have a different world than ours" (Burghardt 2002: 10).

As Derrida laconically asks, "if one defines language in such a way that it is reserved for what we call man, what is there to say?" (Derrida 1991: 116). For there is no way out of such question-begging formulations, described above in factor 1 in the lines of humanist philosophies, according to which humans have language and thus language creates the human, or that human subjectivity is in language and therefore language creates who we really are. (An especially bizarre and essentially nonsensical version of this view was once presented by Kurt Goldstein, who declared that "Language is an expression of man's very nature and his basic capacity [...] Animals cannot have language because they lack this capacity. If they had it, they would [...] no longer be animals" [cited in Griffin 1981: 75]).

But this circular reiteration of the same merely leaves us with nowhere to go. Yet it should also be obvious that this circularity is written into the very core of humanist thinking, of man conceived as the doublet. But the "possibilities or necessities, without which there would be no language, are themselves not only human" (Derrida 1991: 116). Not only does language itself have a nonhuman, evolutionary, embodied and thus non-linguistic origin, but if human subjectivity is shaped and constituted by language that is fundamentally exterior with respect to individual human subjectivities, then this subjectivity is moulded by the nonhuman, twice over. The unthought sedimentations of language and culture in which we are embedded are not "ours", are not appropriable by us as individual subjects, yet neither can we think and act outside of the language and culture that are given to us and whose history and structure elude and predate us. We are not the owners of our thinking, for we are cast into a language and culture that are both external to and older than we are, and which we can never think of as fully ours; yet we cannot think outside them. Language, discourse, modes of practice are "always on the scene before we are, as a radically ahuman precondition for our subjectivity" (Wolfe 2009: 571).

To return to the beginning of this part, it is becoming ever doubtful whether what humanist humanities have attributed to humans does indeed give rise to that solitary and isolated human subjectivity or human being in general; rather, the target of our inquiries should be to see how human societies, subjectivities and cultures are constituted by a network of semiotic relations, most of which cannot

be said to be "human" in any straightforward sense. For all these reasons, we must rather start by inquiring about whether the assertions are true that humanity cannot know the world except by means of human aptitudes and abilities, that human beings will inescapably and unavoidably be the measure of all things. And to humanist philosophies, "to all these warped and twisted forms of reflection" which "refer all knowledge back to the truths of man himself" and which "refuse to think without immediately thinking that it is man who is thinking", we should indeed, with Foucault, respond with philosophical laughter (Foucault 2002: 373).

We are long past the time of telling exclusionary stories of animals, and should rather begin to tell stories that would take, perhaps at first in an admittedly narrative form, an animal gaze at human–animal relations. For there may be room in philosophical thinking for looking at the possibilities of thinking itself, for pushing the boundaries instead of drawing limits. A sort of poetry of thought that is not so much a problem-solving endeavour, but rather an inquiry into the possibility of thinking with animals about human–animal relations. For this, the following presents certain philosophical fables, the sole purpose of which is to see what else we can think with animals.

3. Stories

3.1. Ape

In his *The Open,* Giorgio Agamben provides us with a brief analysis of a fascinating moment in the history of biological thought, that transformative moment when Carl Linnaeus, in the mid-18th century, placed humans among the primates in his grand biological taxonomy, *Systema Naturae*. In retrospect, it is unsurprising that this launched an uproar and an endless polemic about the loss of human divinity and dignity. In fact, this fear of the loss of human dignity and the concomitant attempt to expel the animal from the human, or to refuse the placement of humans among the animals, is endemic to Western philosophical thought to the point that Adorno and Horkheimer are left to note that "The idea of man in European history is expressed in the way in which he is distinguished from the animal. Animal irrationality is adduced as proof of human dignity […] few ideas have taken such a hold on Western anthropology" (Horkheimer, Adorno 1972: 245).

Yet the cleverness of Linnaeus lies goes far beyond merely calling humans apes or *simia* – something which had been discussed and debated ever since Antiquity. It lies rather in the fact that, instead of providing a short *description* of the distinguishing characteristics of human beings, he adds a short *imperative* adage, *nosce te ipsum*, "know thyself". In Agamben's analysis,

> man has no specific identity other than the *ability* to recognize himself. Yet to define the human not through any *nota characteristica*, but rather through

> his self-knowledge, means that man is the being which recognizes itself as such, that *man is the animal that must recognize itself as human to be human.* (Agamben 2004: 26)

In short, humans are animals that must recognise themselves as humans in order to become human. But Linnaeus's cleverness extends beyond this, for this imperative turns into a double-tined prong from which there is no escape. After all, those who consider Linnaeus's placement of humans among apes scandalous should apply the adage to themselves – "in not knowing how to recognize themselves as man, they have placed themselves among the apes" (Agamben 2004: 26) – and in understanding the truth of Linnaeus and in recognising themselves as humans, they have also placed themselves among the apes. In Linnaeus's trick, to either refuse or to accept human animality leads to the recognition of human animality.

3.2. Leaf insect

The leaf insects from the genus *Phyllium* mimic leaves to an uncanny degree, yet in a curious twist of evolution, some species of leaf insects mimic the decaying forms of leaves which are, at the same time, their own food: "Mirroring the necrosis of its own food, the *Phyllium* identifies itself as a dying semblance of its own living sustenance" (Brassier 2007: 43). As a consequence of this morphological confusion, the leaf insects sometimes end up devouring each other – that, at least, is Roger Callois' fantastical conclusion. For him, in his *Mimicry and Legendary Psychastenia*, this represents a case in which the leaf insect and that insect's leaf as its food undergo, in Brassier's words, "an involution which simultaneously engenders the collapse of their identity and the erasure of their difference", which "marks the compulsion whereby the organism is driven to disintegrate into the inorganic" (Brassier 2007: 43). As a symbol of the loss of human uniqueness, mimicry of this particular sort exemplifies a dissolution of the borders between the "inside" of the organism (which in the case of human beings are, in humanist philosophies, thoughts, ideas, representations and the like), and the "outside" world of the unknowable, resulting in what Caillois himself called "depersonalization through assimilation to space" and likened it to the situation of schizophrenics:

> when asked where they are, schizophrenics invariably reply *I know where I am, but I do not feel as though I'm at the spot where I find myself.* For dispossessed minds such as these, space seems to constitute a will to devour. Space chases, entraps, and digests them in a huge process of phagocytosis. Then, it ultimately takes their place. The body and mind thereupon become dissociated; the subject crosses the boundary of his own skin and stands outside of his senses. He tries to see *himself, from* some point in space. He feels that he is turning into space himself – *dark space into which things*

> *cannot be put*. He is similar; not similar to anything in particular, but simply *similar* [...] These expressions all bring to light one single process: *depersonalization through assimilation into space*. In other words, what mimicry morphologically brings about in certain animal species. (Caillois 2003: 100)

This description bears an uncanny resemblance to the struggles that many philosophies undergo in their attempts to retain human uniqueness in the face of all the forces – from biology to cognitive sciences – that threaten to dethrone him. The human figure, no longer knowing his precise spot, is dissolved into space and from then on is merely *similar*, and nothing unique can any longer be put into that dark space of the mind which he previously thought to be his sole possession.

The praying mantis, too, presents itself as precisely the same sort of symbol of the fear of the loss of human uniqueness. The various species of praying mantises, which can mimic a petal, a branch, a leaf with a stupendous resemblance, present us with a case "whereby the insect loses its identity and returns to the plant kingdom" (Caillois 2003: 80). But the praying mantis has yet another lesson. As is well known, the male praying mantis is decapitated by the female during reproduction. This adds another layer to this allegoric insect play, for in this case, the fear of the loss of human uniqueness results in a state of undeath, as it were, where the human being, decapitated from his language and representations, retains the capacity of behaviour but is no longer alive as a sovereign being:

> there are very few reactions the mantis cannot perform in this decapitated state – that is, without any center of representation or voluntary activity. In this condition [...] (this is truly frightening) [it can] lapse into a feigned *rigor mortis* in the face of danger or when the peripheral nervous system is simulated [...] it is so difficult, I think, both for language to express and for the mind to grasp, that the mantis, when dead, should be capable of simulating death. (Caillois 2003: 79)

3.3. Mole

A curious reversal of the human–animal gaze in the form of a critique of anthropological studies of material culture is presented by Tim Ingold in his *Being Alive*. Such studies are wont to follow dimension 3 as presented in the beginning of this chapter. Material culture amounts to a reshaping of matter on the basis of human ideas or conceptions, so that the originally "culture-free" material is changed on the basis of a pre-existing mental plan, thereby imbuing the matter with "culture" through the workings of human hands and tools. Yet Ingold asks us to reverse the gaze and think of what material artefacts would be thought of if we were to imagine "anthropologically trained moles, of a philosophical bent"

(Ingold 2011: 23). It is the human embodiment and behaviour which lead us to the perception of artefacts as reshaped matter imbued with human mental plans. Ingold writes that burrowing animals such as moles, whose worlds consist of corridors and chambers,

> would doubtless insist that the materiality of the world is not culturally constructed but culturally excavated […] in the sense that the forms of the things are hollowed out from within rather than impressed from without. In their eyes (if they could see) all that is material would reside beyond the objects of culture, on the far side of their inward-facing surfaces. Thus these objects could be phenomenally present in mole-culture only as material absence – not as concrete entities but as externally bounded volumes of empty space. The very idea of material culture would then be a contradiction in terms. (Ingold 2011: 23)

A mole burrowing holes is a mere matter of its behaviour, being of no interest to a philosopher who, as per dimension 3, only deems something worthy of note once it can be related to some purportedly "higher" mental capacity. Yet once we extend imaginatively such a capacity to the mole, who then, without hesitation, commences its cultural activity, the human-centric conception of "material culture" is thrown into doubt.

This short quote is a prime example of a sort of imaginative philosophy in which an animal looks at humans, and under this gaze we rethink our thinking. "Other animals are held by the look. Man becomes aware of himself returning the look" (Berger 2009: 5), and will render inoperative the belief in the pretence that human conceptions are universal in the sense that they should either be withheld from animals, or extended to them in a straightforward manner. In thinking about the mole, the former represents the commonplace anthropocentrism of the doublet, and the latter leads to a critique of the possibility of simply attributing to animals that which the doublet, as per dimension 1, first discovered in himself. Instead, the mole is a method for studying man.

3.4. Vampyroteuthis

An exceptionally curious and fascinating book was published by Vilém Flusser and Lois Bec (2012 [2000]). Due to the strange nature of the book, what follows is a retelling of one of its more philosophically interesting moments. Interested readers are invited to read the very short book in its entirety, for it contains many more strange and fascinating things than can be presented here. The story is presented as a series of oppositions in capacities and "thinking" between humans and vampire squids.

"The vampyroteuthic world is not grasped with hands but with tentacles," they begin. "It is not in itself visible (apparent), but the vampyroteuthis makes it so with its own lights" (Flusser, Bec 2012: 38). Both worlds, those of humans and of vampire squids, can be touched and seen, but the ways of observing are different. Humans experience a world that is concrete, as things that can be grasped with hands are wont to be. To experience the world, we must move through it in order to grasp it because the tentacles of our hands (that is, our fingers) are the products of a limb previously used for locomotion. The vampire squid, on the contrary, grasps the world with its eight tentacles that surround its mouth and whose original purpose was to move the flow of food towards the digestive tract. "The world grasped by the vampyroteuthis is a fluid, centripetal whirlpool" (Flusser, Bec 2012: 38), and it grasps the world in order to differentiate between the things flowing within it. The result is that

> Whereas our method of comprehension is active – we perambulate a static and established world – its method is passive and impassioned: it takes in a world that is rushing past it. We comprehend what we happen upon, and it comprehends what happens upon it. Whereas we have "problems," things in our way, it has "impressions." Its method of comprehension is impressionistic. (Flusser, Bec 2012: 39)

Both of our worlds are thus concrete, as they consist of concrete objects that can be apprehended and comprehended. For both of us, everything in the world has clear outlines and a firmness to them, for which reason they can be manipulated. In both cases, there is present a subject faced with objects that can be manipulated. Yet the contrast between our two worlds remains vast. For us, "objects are problems – obstacles – that we handle simply to move out of our way," and therefore our engagement with the world is "activity aimed against stationary objects, a deliverance from established things" (Flusser, Bec 2012: 39). For the vampire squid floating in a water current, the objects are, to the contrary, free-floating entities that come to it. We move, encounter objects, and declare them to be problems to be removed; for the vampire squid, objects move and appear to it, to be then sucked in and incorporated. Its activity is

> of discriminating between digestible and indigestible entities, that is, a critique of impressions. Culture is not, for it, an undertaking against the world but rather a discriminating and critical injection of the world into the bosom of the subject. (Flusser, Bec 2012: 39)

As every philosopher knows, we do not perceive the world directly, but only as it appears to us by the mediation of our sense organs which gives rise experience. Since appearances are misleading, our constant philosophical goal is to get behind appearances, to get rid of mere experience and lowly sense impressions.

The vampire squid's world, however, does not appear, because it lives in darkness. "The vampvroteuthis itself irradiates the world with its own point of view. Its bioluminescent organs engender appearances, that is, phenomena" (Flusser, Bec 2012: 39). Whereas we instinctively believe that there is a reality behind appearances, the vampire squid cannot have a similar thought, because the appearances are its own creation: there is world only inasmuch as it has floated to the squid who then makes it appear. We think that there are things in themselves which we must reveal by removing the veil of mere experience; the vampire squid creates the world and as such cannot be deceived by it. For the squid, there is no "outside" toward which to struggle.

And this is the message we can draw from these fervent imaginations about the vampire squid, which well applies to the other examples of philosophical animals presented above, and perhaps should be one of the guiding lines of our thinking about animals:

> The world of the vampyroteuthis requires, therefore, ontological categories that differ from our own. Its are those of nocturnal passion, ours of diurnal clarity. Not one of wakeful reason, the vampyroteuthic world is rather one of dreams. […] As complex beings with complex brains, we are both partially rational and partially oneiric (Flusser, Bec 2012: 41)

4. Conclusion

In the infamous last sentence of his *The Order of Things*, Michel Foucault declares that if, due to some unforeseen event or shift, the empirico-transcendental doublet were to disappear, then "one can certainly wager that man would be erased, like a face drawn in sand at the edge of the sea" (Foucault 2002: 422). The species turn has the opportunity to be part of this process, which could perhaps one day lead to a positive figure who understands that as long as they exist, they have always already been something other than themselves, always someone else. That in fact these doublets are seized into and intertwined with a world in which their exteriority and alterity constantly create and renew them, and that everything which "man" the doublet deemed to be his own propriety, such as language, culture, and rationality, is in fact exterior to him and is neither chosen nor created by him, and cannot be entirely reduced to them without remainder.

It is clear that the above stories are but mere metaphors, allegories, even hallucinations. But perhaps they help us dislodge some of our habits and help us to move towards more scientifically grounded ways of doing something similar, of which the Uexküll-based *umwelt*-studies, also featured in this very collection, are a prime example.

Acknowledgements

The research for this chapter was supported by the institutional research grant IUT02-44 from the Estonian Research Council and by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Human perceptions of animals: a multimodal event analysis of interview data

Paul J. Thibault, Morten Tønnessen

1. Introduction

This chapter presents fieldwork focused on people's perception of wolves and selected animals the wolf is often perceived as being in conflict with (Skogen *et al.* 2013, cf. also SKANDULV). People's perceptions of wolves are of interest for several reasons: first, because wolf management, even more than other wild predator management, is controversial; second, because wolves represent a charismatic species which has given rise to a rich array of cultural imagery; and third, because wolves are to some extent perceived as symbolic (i.e., representative) of other large carnivores – at least this is the case in the Scandinavian context (see Tønnessen 2010, 2011). Wolves have been reestablishing in Southern Scandinavia for about a generation, and the viability of the population has so far relied on continued migration (Vilà *et al.* 2003). The legal status of wolves in Norway, where the reported interviews were carried out, is complex – wolves are considered a protected species and generally accepted in a rather small "wolf zone" in the Central/Eastern Norway. However, in effect wolves are generally not tolerated outside this zone (though policies may vary in different regional "predator zones"). A majority of wolves die due to legal and illegal hunting, both of which are widespread.

In Norway, wolves are particularly associated with predation on sheep, even though official data show that wolves are responsible for only 4–5% of reported predation on sheep, and that wolverines and lynx in particular account for much more of the predation on sheep (Rovdata, cf. also Skogen *et al.* 2008). This goes to show that the wolf is perceived as a symbol of large predators in general (and that the general public is not always well informed about actual wolf ecology). In certain regions of Norway, particularly in Central/Eastern Norway, wolves have provoked locals by attacking hunting dogs. In the far North, migrating wolves are occasionally involved in predation on reindeer – as are other large predators, including the Golden Eagle – which are herded by the Sami people. In all these cases, people's livelihoods or traditions are at stake. While the discourse on wolf conservation is clearly related to animal representations (Tüür, Tønnessen 2014), then, it is also related to obvious material conflicts.

Using techniques derived from Multimodal Event Analysis (MEA) and Cultural Thematic Analysis (CTA), the study analysed participants' accounts of, attitudes to and reactions towards selected display materials. The term 'perception' used in the title of this chapter refers to participants' experiences with, ideas about and attitudes towards the study animals, as revealed in the interviews. Methodologically, the display materials are thus used in order to elicit responses that provide information about the participants' perception of the study animals. The display materials included video clips, audio recordings of animal vocalisations, and images. The semi-structured interviews also included a few standard questions – these are described in the section 'Interview Design'.

The techniques of MEA were deployed in order to analyse the full range of interviewees' meaning-making resources, including vocal utterances, gestures, facial expressions and other relevant body movements. The purpose of MEA in conjunction with CTA was to identify salient cultural thematic patterns, evaluative stances and feelings experienced by the participants in their encounters with the display materials and their recounts of their experiences of the study animals.

With this chapter, we aim to demonstrate the feasibility of the research method described here, by way of theoretical presentation and sample analysis. While CTA has occasionally been used in the study of human–animal relations (see e.g. Stibbe 2012), MEA has to our knowledge so far not been much used within Human–Animal Studies.

2. Interview design

The data consists of video recordings and observations of a series of semi-structured interviews conducted in Norway in 2015. The pilot study on which this chapter is based took place at the University of Agder in Kristiansand, Southern Norway, on February 10th 2015. In the Agder region where Kristiansand is located, there are occasionally migrating wolves, but they have not been allowed to establish territories (instead they have eventually been shot dead). Further interviews were later (in Spring 2015) conducted at three more locations: Kautokeino (in Northern Norway, in the county of Finnmark), Rendalen (in Cental/Eastern Norway, in the county of Hedmark),[1] and Stavanger (in Southwestern Norway, in the county of Rogaland – control group). Study animals other than wolves include hunting dogs, reindeer (particularly relevant in Kautokeino, a centre for Sami culture and traditions) and sheep (particularly relevant in Rendalen). These animals have been selected for study due to their centrality in regional discourses on wolf management. At each of the field locations, participants were recruited from relevant interest groups, which included hunters, sheep farmers, reindeer herders, environmentalists and hikers. The data analysed in this chapter, from the

[1] Rendalen is located straight outside the wolf zone.

pilot study, consists of four interviews. A total of 13 interviews were conducted in the whole study, with approximately 10 hours of video recordings, most of it shot from two different angles.

2.1. Interview setup

For the pilot study, we made use of the interview setup outlined in Figure 1.

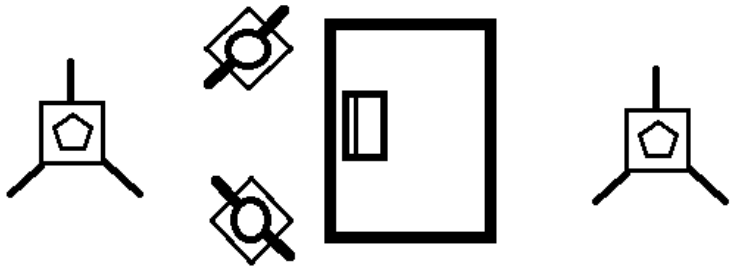


Figure 1. Bird's-eye view of the interview setting showing camera positions relative to interviewer and interviewee. In the figure, the two video cameras are on the extreme left and right, with the interviewer and the interviewee sitting on tilted chairs in front of a laptop placed on top of a table.

As the figure shows, the interviewer and the interviewee were sitting on the same side of a table, with a PC (laptop) in between them. The two cameras were positioned so that one, the back camera (left), would film the back/side of the interviewer and the interviewee plus the screen, while the other, the front camera (right), would film the interviewer and interviewee frontally, close-up. Generally Tønnessen served as the Interviewer, whereas Thibault operated the cameras.[2]

The display materials shown to all interviewees during the pilot study included three audio clips, six images, and two video clips (in this order). While wolves were represented in all media types (one audio clip, three images, and both video clips), other study animals featured in display materials included sheep (audio clip, image), dogs (audio clip, image), moose (image), reindeer (image), and elk (video clip). Humans were featured in three of the images, two of the audio clips, and one

[2] Before the pilot study, we planned a somewhat different interview setup, with the interviewer and the interviewee sitting each on their side of the table, and the laptop facing sideways. As we were about to get started with the first interview, however, we realised that this was not practical. It is much more advantageous to have both watching the PC screen from the same side of the table as the basis for their interaction about what the two see. In order to accommodate the adjusted setup, the chairs of both the Interviewer and the Interviewee were placed in a slightly angled position, leaning inwards towards the screen, so that their gestures and part of their faces were visible on camera.

of the video clips. Two of the animals displayed in images – a moose and a wolf respectively – were dead, the rest alive. In the six display materials featuring wolves, the wolves were socialised wolves kept in zoos (Norway/USA) in four cases and wild in two cases (radio-collared in one case). Three of the six images were in black and white (with one being of old age), the other three in colour.

In addition to being shown display materials, the interviewees were asked to state personal details and were asked a few questions. The questions concerned what kind of animal the wolf is (before display materials were shown), whether the interviewees have any particular attitude to wolf management (after display materials were shown), and whether they reacted strongly in emotional terms to any of the display materials shown (final question). The interviews furthermore included a short debriefing.

2.2. Preparing the interviews

Preparations for the fieldwork took place in the period of November 2013 to February 2015. Initial preparations included outlining basic methodology and the expected interview design with the use of display material and the video recording of the interviews. Preparations closer to the pilot study included selecting display materials, drafting the interview guide and an information letter. More mundane tasks included buying and testing technical equipment, arranging localities for the interviews, and reporting to Norway's Data Protection Official for Research, based at Norwegian Social Science Data Services (NSD). We also spent time recruiting respondents and made sure that informed consent was obtained at the onset of interviews.

2.3. Gathering of data

The study involved voluntary participants who were recruited by the researchers. The interviews lasted for up to an hour each and were all video recorded. However, we had some technical problems with one of the two cameras we used, and the third was therefore concluded with only partial use of the second camera (front camera), whereas the fourth and final pilot study interview was conducted as a whole with the use of only one camera (back camera). The pilot study thus resulted in four interviews and a total of seven sets of video recordings.

2.4. Processing of data

The video material was catalogued and processed by the research assistant Laura Kiiroja, MA, in line with instructions developed by Thibault and Tønnessen. This took place in May 2015. The material presented in this chapter has in turn been analysed by Thibault and Tønnessen.

3. Theory

This study employs a Cognitive Ethnographic framework (Alač, Hutchins 2004; Hollan *et al.* 2000). Our conceptual framework is based on the theory of distributed cognitive systems (Alač, Hutchins 2004; Hutchins 1995a, 1995b, 2010; Clark 1997, 2008) and Multimodal Event Analysis (Baldry, Thibault 2006, 2008; Steffensen *et al.* 2010. Our main unit of analysis is the Interviewer-Interviewee-Artefact Interaction System (IIAIS) that is constructed in the video recorded interviews that are the data of this study. As Alač and Hutchins (2004) argue, cognitive ethnography combines traditional long-term participant observation with the microanalysis of specific occurrences of multimodal events and practices. The cognitive aspects of the observed practice are revealed in the detailed multimodal microanalysis. The multimodal microanalysis is concerned with the specific properties of the IIAIS. The participant observation is concerned with how the concepts, values, and predispositions of participants shape and become shaped by the IIAIS.

The unit of analysis will be analysed using the following constructs:

3.1. Participant Evaluation Protocol (PEP)

The PEP consists of the triangulation of Semi-structured Interviews, Multimodal Event Analysis (MEA), and Cultural Thematic Analysis (CTA), as set out below:

3.2. Semi-structured interviews

In a non-directed way, interviewees will provide information about the ways in which they exploit and orient to the affordances of the IIAIS in the interview tasks. Using video of individual participants observing and talking about their own encounters with the target animals and about their reactions to the display materials, we will elicit reflection on their understandings of the video recorded activity in which they participated, with a specific focus on what aspects of the IIAIS shape and guide the activity, thinking, perceptions, and predispositions of the interviewees in the designated interview tasks. For example, we seek to discover how these affordances enable learners to select, connect and focus on the cognitively and perceptively salient aspects of the task in ways that promote particular culturally scaffolded perceptions of animal agency and culturally shaped meaning orientations.

In the current study, semi-structured interviews were conducted and video recorded with varying degrees of homogeneity/heterogeneity in the composition of respondents. In the pilot study, there was an overrepresentation of (1) female, (2) older respondents (3) with higher education and (4) membership in an environmental NGO. At other field locations, the composition was different, so

for the study as a whole these factors (gender, age, education, NGO membership) were more balanced. Semi-structured interviews allow for the articulation of how the activation of prior knowledge and predispositions and the elaboration and co-construction of new knowledge occurs throughout the interaction process (see Ratner 2000). Using video of the participants engaged in the assigned tasks within the IIAIS, participants will be asked to observe and talk about the animals they view or hear in the display materials. For example:

- How do coordinated patterns of activity link interviewees to tasks and enable them to organise, segment, and link the different parts of the task into meaningful experiences?
- What aspects of the display materials do they see as salient, important, and relevant?
- What predispositions impede or promote their accounts of their encounters with the display materials and their own experiences of the target animals?
- Do richly multimodal interactive tasks in the IIAIS enhance particular affective responses and positive and/or negative predispositions to the featured animals?

3.3. Multimodal Event Analysis (MEA): some theoretical considerations

The purpose of Multimodal Event Analysis (MEA) is to identify the various types of participant-task coordination situations and the resources and affordances used in them. The structure of the real-time participant-task coordination situations, when participants engage in specific tasks of various kinds, will be identified and classified in the study. MEA focuses on what participants do, their roles, the activities they perform, and the affordances that they interact with. Multimodal interactive events are cognitive events that coordinate persons and resources in cognitive and perceptual tasks and problems. MEA focuses on the micro-analysis of specific occasions of interaction using the techniques and procedures of multimodal analysis (Alač, Hutchins 2004; Thibault 2004, 2011; Baldry, Thibault 2006, 2008). MEA provides essential data on which semiotic and material resources (e.g. visual, gestural, kinesic, linguistic, tactile, etc.) are co-deployed, how, and when, in the activities of participants and in their interactions with both other participants and relevant artefacts, such as the display materials. A small digitalised multimodal corpus or database based on the video recorded data will be constructed (see Baldry, Thibault 2008). The concordances arising from searches in a multimodal corpus provide preliminary data that will in the longer run help to support or refute our basic theoretical assumption concerning the communicative resources and their co-deployment that are involved in participants' engagements with and representations of animals and their agency. Initially, the corpus resulting from the pilot study will help to set up a research tool that will serve as the point of a departure for a larger scale study, involving several

locations in Norway. The development of such a corpus requires the development of appropriate transcription techniques and procedures prior to the entering of the tagged corpus data into the database. These techniques and procedures will be adapted from those proposed in Baldry and Thibault (2006, 2008).

The term 'multimodality' refers in the present context to the ways in which different bodily and extra-bodily semiotic resources or 'modalities' are selected, combined, and attended to in the real-time construction of multimodal events, such as the video-recorded interviews in the present study. Multimodal transcription is a flexible and adaptable research tool that can be used across a wide range of research contexts, including, for example, multispecies interaction (Thibault 2004). Multimodal transcription serves to show how different semiotic resources are combined and co-deployed in interactive events by transcribing the different resources, their relations to each, and their significance to the whole event (Baldry, Thibault 2006). Most transcription techniques in the field of discourse analysis have until quite recently been overwhelmingly biased towards the verbal (lexicogrammatical) aspect of language. The reduction of embodied interactive events to abstract verbal patterns as in discourse-analytical approaches misses most of what is significant in the way humans coordinate in their social worlds (Thibault 2008, 2011). Multimodal transcription of interactive events shows how different semiotic resources (e.g., body movements, deictic points, facial expressions, gaze, gesture, voice dynamics, and so on) combine with and co-contextualise each other in interactive events between persons and between persons and aspects of their physical and social environments. Therefore, the transcription procedures to be adopted will reveal the multimodal character of the meaning-making activity of participants when they engage with the various interview artefacts. In this way, it is possible to show how different classes of phenomena – words, images, actions, objects, gestures, and so on – are systematically related to each other as parts of a larger whole. This change in emphasis has important consequences for analysing and understanding the nature of both the activity-structures that regulate human interaction and the ways in which cognitive capacities are built up over time by the development and orchestration of cultural thematic patterns and other multimodal patterns whose appropriate contextualisation often depends on participants' attunement to very fine-grained or pico-scale bodily events on time scales ranging from milliseconds to fractions of seconds (Cowley 2007, 2009; Thibault 2008, 2011). In the tradition of semiotic research, this approach resonates nicely with the emphasis that the American semiotician Charles Morris (1946), working in the tradition of American pragmatism, placed on the detailed observation of bodily behaviour. Our approach thus provides a way of understanding semiosis as a mode of embodied action that enables human and other agents to enact and construct their semiotic *innenwelten* and *umwelten* (in the sense of von Uexküll, cf. chapters 1 and 2 in this volume).

Four stages are envisaged in the future construction and analysis of the multimodal corpus mentioned above:

1. collecting an initial corpus and converting it to a digital format suitable for online concordancing;
2. tagging event types and resources and searching such a corpus and
3. producing multimodal transcriptions of selected situations in the data which is collected;
4. developing the theoretical model on the basis of the multimodal corpus.

Corpus data will provide information on co-occurrence relations, the combinatorial capacities of different resources, the constraints on usage of resources and their combinations, and how different resources provide information about each other. The corpus thus provides both quantitative (statistical) and qualitative information as to how cultural constraints shape participants' perceptions and accounts of animals in the population of participants in this study. The coded corpus data also provides the input to the analysis of salient cultural themes in the data.

3.4. Cultural Thematic Analysis

The Multimodal Event Analysis of the video recorded interviews provides the basis for the identification and analysis of the cultural meanings that are expressed by the interviewees. Cultural meanings are thematically organised patterns of cultural-semantic meanings. Cultural Thematic Analysis (CTA) emphasises the cultural origins of these themes, rather than suggesting that they reflect a purely individual level of analysis. Their analysis and interpretation require the identification of relevant meaning units – both verbal and nonlinguistic – together with the social activities, experiences, concepts, and artefacts that are embedded in the expression of particular meaning units (Ratner 2002: 167). As the first step in the analysis of Cultural Themes, concrete meaning units as articulated by interviewees in their talk are identified so that psychologically salient Central Themes can be extracted from the meaning units so identified. A Central Theme is an abstraction from the data provided by meaning units that enables a number of meaning units to be grouped together as a single Central Theme. A Central Theme is a psychologically salient unit in the sense that it reflects a meaning that is personally significant for the interviewee rather than one that is imposed by external criteria invented by the analyst (Ratner, 2002: 167–168). Central Themes provide the basis for the extraction of General Themes that group a number of Central Themes under the one more abstract heading. General Themes express the more general cultural significance of Central Themes. They are a further level of abstraction from the data provided by concrete meaning units. An illustrative Cultural Thematic Analysis is provided in Section 4.4 below.

4. Analysis of data

In the analysis of this material, we do not emphasise factual utterances, whether correct or incorrect, as much as we emphasise the interviewees' *perceptions* of multimodal display materials involving wolves and related study animals. Factual mistakes, in this context, can be informative of how something is perceived, but factually incorrect statements made by interviewees are no less interesting and telling in principle than factually correct statements (for an example, see Sample analysis below).

Table 1 presents key personal details for the four interviewees that constituted the pilot study. As it shows, three of the four interviewees were members of an environmental NGO, with one of them working for it. All four were pro-conservation, with two of them being satisfied with *status quo* policies, the other two opining that current wolf management policies are not favouring conservation aims to the extent that they should. Notably, all four interviewees had higher education, three of them were female, and three of them were quite old, i.e. 58–70 years old. These are noteworthy demographic characteristics of this small group of interviewees. Although the number of interviewees is so low that no statistics can meaningfully be made, the perspectives of the interviewees must be expected to correlate somewhat with such demographic characteristics.

4.1. Multimodal Event transcription and analysis

In this section, we will analyse two brief excerpts from the video recorded interviews that formed part of the pilot study. Multimodal Event Analysis (MEA) is applied to two short video clips, which were extracted from the interviews. The interviewees are identified as Interviewee 1 and Interviewee 4, respectively. Table 2 presents relevant descriptors used in the identification and analysis of the two excerpts.

Multimodal Event Analysis (MEA) begins by segmenting the video recorded interviews into smaller phases or sub-phases that are coded according to Event Type. An interview consists of a diversity of phases and corresponding event types such as those shown in the two transcriptions and associated analyses featured below. A second aspect of the coding process includes the identification of the semiotic resources (e.g., gaze, gesture, pointing, posture, verbal patterns, voice dynamics, etc.) that are the focus of a particular transcription. Transcriptions are selective in this sense; they do not attempt to transcribe every possible feature but focus on those of most interest or relevance according to the goals of the analysis and criteria of interest and relevance decided upon by the analyst. In this sense, the multimodal transcriptions shown below are guided by pragmatic criteria. A given co-selection of resources, e.g., verbal patterns and hand gestures, as in the transcription below of Interviewee 1, is also tagged in accordance with the cultural-semantic patterns that are evidenced in a particular selection. 4.3.2 sets out the tagging parameters for the two examples that are analysed below. At this early stage, these parameters remain provisional and therefore liable to revision in the further development of this work.

Table 1. Personal details and attitudes to wolf management.

Interviewee	Gender	Year of birth	Profession	Relevant hobbies	Attitude to wolf management	
					Pro or contra conservation	Sample citation
1	Female	1975	Works for environmentalist NGO. Educated as entomologist (MA).	Environmentalist. Sheep husbandry (wild sheep, collectively).	Pro conservation	"I have a feeling that too many [wolves] are shot […] and that there are too few wolves in Norway"
2	Female	1957	Structural engineer.	Member of an environmental NGO. Dog-owner.	Pro conservation	"I think they are very reluctant with conservation of the wolf"
3	Female	1945	Retired university professor.	Member of an environmental NGO.	Pro conservation à la current policies	"It [the wolf] is allowed to be in some places, but not everywhere – and that's a good starting point"
4	Male	1945	Retired legal professional.	Forest owner.	Pro conservation à la current policies	"I fully understand that these young lone male wolves […] are shot and hunted"

Table 2. Relevant descriptors used in the identification and coding of the two interview excerpts.

Interviewee	Location	Position in Video Data	Event Type	Duration Measured in ELAN	Display Material Responded to	Semiotic Modalities Analysed
1	Pilot Study; Kristiansand	Back Camera 1; 12.56–13.26	Recount	00:00:05.000 to 00:00:24.473	Audio File No. 3	Hand-arm gesture; Verbal
4	Pilot Study; Kristiansand	Back camera 1; 12.43–14.50	Perceptual Problem Solving	00:00:03.000 to 00.00:21.100	Image No. 2	Gaze; Pointing; Posture; Verbal

4.2. Transcription conventions

Each stage of the transcription is identified by a numbered Frame. Frames are of no fixed duration; they refer to a meaningful unit or sub-unit that is illustrated by a screen shot. In the row above each Frame, the Frame No. and the duration of each Frame are shown according to the time measurements derived from the software program *ELAN Linguistic Annotator Version 4.9.0*. The transcribed verbal text of each participant is in italics. Other relevant bodily actions are indicated in normal font. The '+' sign indicates that one action is concurrent with another. Using ELAN 4.9, time measurements (e.g., duration) are expressed in minutes, seconds, and milliseconds in the following format: 00:00.000, e.g. 00:02.436 is equivalent to zero minutes, two seconds and 436 milliseconds.

The multimodal transcriptions derived from the application of MEA are presented below, in 4.3.2 and 4.4.3.

4.3. Sample analysis 1

This sample analysis is based on Interviewee 1's response to Audio Clip No. 3, featuring a bleating ewe and a lamb. She first indicates that she thinks there were several sheep and identifies a lamb, adding "perhaps". Just before the sample excerpt starts, the interviewee has been asked by the interviewer whether bleating is a form of communication – to which she says: "Yes, of course it is" – and whether it is possible to tell what is happening in the recorded situation involving a lamb and an adult sheep.

For the verbal transcript (in the Norwegian original plus an English translation), see Appendix 1.

4.3.1. Multimodal Transcription of Interviewee 1 – preliminary details

Participant: Interviewee 1; Pilot Study
Location: Kristiansand
Display Material Responded To: Audio File No. 3
Event Type: Recount
Resources: Hand gestures, verbal patterns
Duration: 19.473 seconds (19 seconds and 473 milliseconds)

4.3.2. Multimodal Event Transcription; Interviewee 1; Back camera 1

Frame 1: 00:05.000 – 00:09.000

I1: eh, *altså, nå har jeg mest erfaring med villsau* I: *mm*
Frame 2: 00:10.201

I1:

Frame 3: 00:10.514

I1: onset phase of gesture: arms extend outwards I1: *og de*
Frame 4: 00:10.879

I1: … *lager* + both hands rest on upper leg

Frame 5: 00:11.192

I1: … *lager* … + moves converging hands along upper leg away from body
Frame 6: 00:11.532

I1: *ikke så mye lyd* + moves hands back towards body

Frame 7: 00:11.688

I1: *hvis ikke det er et eller* + moves hands away from body

Frame 8: 00:12.627

I1: *anna galt da* + three rapid movements of hands up and down leg (up + down + up)

Frame 9: 00:12.967

I1: *sånn for* + hands raised above upper leg

Frame 10: 00:13.175

I1: *eksempel* + hands continue to be raised and converge

Frame 11: 00:13.828

I1: *når vi tar* + hands lowered to leg; gesture beat synchronised with 'tar'
Frame 12: 00:13.428

I1: *når vi* + hands raised (as shown) then lowered (see next Frame)

Frame 13: 00:18.733

I1: *skiller lamman og sauane … da er det veldig mye lyd i de* + position of hands maintained without moving them

Frame 14: 00:19.046

I1: *da driver* + left arm extended from previous resting position to position shown

Frame 15: 00:19.854

I1: *de* + left arm-hand raised to high position (00:19.411) then lowered to position shown

Frame 16: 00:20.846

I1: *mødran og roper* + left arm raised (00:20.324) then lowered (00:20.637) + right hand begins to raise from previous rest position (00:20.820 – 00:20.846)

Frame 17: 00:21.707

I1: *svarer* + right hand raised (00:20.663) and both hands raised make little up-down flourish synchronised with 'svarer'

Frame 18: 00:22.072

I1: *lamman* + two hands begin to converge in synchrony with first syllable of 'lamman'

Frame 19: 00:22.177

I1: *lamman* + hands converge without resting on second syllable of 'lamman'

Frame 20: 00:22.333

I1: *skal de* + without resting the speaker's hands then cross over as shown

Frame 21: 00:22.646

I1: *prøve å finne* + hands then separate to position shown
Frame 22: 00:23.272

I1: I1: *hverandre* + hands then cross over as shown I: *Ja*

Frame 23: 00:24.473

I4: *ikke sant* + hands separate, held wide apart (as in Frame 21) then converge, left hand held above right hand (00:24.264) then cross over, as shown, and retract to resting position close to abdomen

4.3.3. Analytical discussion of the transcription

The transcription data of the episode transcribed in 4.3.2 shows Interviewee 1 constructing a Recount of her experience of the sounds made by wild sheep in response to Audio Display Material No. 3, which featured a ewe and her lamb calling to each other.

The episode consists of four sub-phases, as follows:

Orientation: Frames 1–2;
Event: Problem/Generalisation: Frames 3–8;
Event: Exemplification: Frames 9–13;
Solution: 14–23.

Overall, the four sub-phases shown above unfold the structure of a Recount. In the Orientation, Interviewee 1 orients to the audio file she has just heard by grounding her Recount in her experience with wild sheep ('villsau'). In doing so, she differentiates this experience from the possible significance of the audio file, which featured farm sheep, and thereby provides the basis for the brief recount that follows. Frames 1 and 2 thus establish the mutual orientation of the Interviewer and Interviewee 1 to each other, as shown in the interpersonal coordination of body posture and gaze in Frames 1 and 2. The two speakers orient

to each other rather than the computer screen as Interviewee 1 develops, in the ensuing Frames, a complex response to what she heard in the Audio File without directly referring to it. The mutually oriented body postures and gaze vectors of the two participants are maintained throughout the entire episode except in Frames 17–22, when the Interviewer looks at the question sheet on the desk in front of him before then resuming the previous postural orientation in Frame 23.

Frames 3–8 give voice to a general statement in the present tense that is linked to the general condition for the statement to be valid by the conjunction *hvis* ('unless'), as follows:

> De lager ikke så mye lyd (GENERAL SITUATION)
> Conditional Conjunction: hvis
> ikke det er et eller anna – galt, da (CONDITION)

The semantic structure GENERAL SITUATION + CONDITION also gives voice to the meaning problem, which is then exemplified by a specific instance in Frames 9–13. Frames 3–8 give voice to a complex meaning that is co-articulated by the closely synchronised verbal pattern and the hand-arm gesture shown in the transcription. In Frame 3, the onset of the gesture is shown as I1's two hands extend from their initial resting position in synchrony with the word *de* ('they'). The two hands become the 'they' of the sheep in Frame 3. In Frame 4, the hands complete an initial downwards movement from the position shown in Frame 3 and come to rest on I1's upper leg before they move in parallel further along the leg away from the speaker in Frame 5. In Frame 6, the hands reverse the direction of the movement, which is now towards the speaker in synchrony with the wording *ikke så mye lyd* ('not so much sound'). In Frame 7, the hands again move away from the speaker in synchrony with the wording *hvis ikke det er et eller* ('unless there is something … '). Frame 8 concludes this sub-phase. Frame 8 evidences an increase in tempo of the same movement, which is performed three times in a rapid AWAY FROM SPEAKER-TOWARDS SPEAKER-AWAY FROM SPEAKER sequence in synchrony with the wording *anna galt da* ('something – well, wrong'). The intensification of the movement characteristic of this sub-phase may be seen as the marker of the Problem or Crisis stage of the developing narrative-like structure. Overall, the gesture in Frames 3–8 features an Actor-Movement Vector in which the two hands of the speaker realise the participant role of the sheep ('de' in the verbal text) and the hand movement up and down the speaker's upper left leg realise the sheep moving together as a cohesive and silent group. The upper leg is the space in which the sheep move. It is also noteworthy that the two hands are pointed inwards towards each other in a way that imagistically portrays the harmony and cohesiveness of the flock until something goes wrong, as suggested by the increase in tempo of the hand movement in Frame 8. This modulation of the previous movement – the more urgent or agitated quality of

the hand movement – anticipates the perturbation of the previously harmonious situation that is articulated in Frames 9–13.

Frames 9–13 specify a particular instantiation or exemplification of the general meaning of 'something – well, wrong' in Frame 8. In Frame 9, the two hands are raised above the speaker's leg and converge in Frame 10 to a position above the speaker's leg. The movement of the hands to a position above the leg realises a new joint Actor, i.e., the sheep herders, and their viewing position. Linguistically, this Actor is realised by the pronoun *vi* ('we') in Frames 11 and 12. The change in the position of the hands to the raised position together with their convergence and the maintaining of this position in Frames 10–13 realises the action of the herders on the sheep. In Frames 12–13, the hands move from the high position to a resting position on the speaker's leg in synchrony with the verbal pattern *når vi tar* ('when we take'). The gesture realises the semantic structure Actor-Action-Goal: the hands (Actor) act on the flock of sheep (Goal) by taking them (Frame 12) and separating lambs from sheep (Frame 13). The resting position of the two hands as shown in Frame 13 is conspicuously maintained for 00.313 ms before the transition to the next sub-phase in Frame 14.

Frame 15 marks the beginning of a new gesture. In Frame 14, the right hand maintains the previous position (Frames 13–14) while Interviewee 4's left hand is extended leftwards from the previous resting position and is raised upwards and then lowered again to the position shown in Frame 15. This movement is synchronised with the wording *da driver* ('then [they/someone] do …'). In this case, the hand-arm realises the participant role of the mothers calling their lambs, which is continued in Frame 16 with a further up-down movement of the speaker's left arm in synchrony with the word *mødran* ('the mothers'). In Frame 16, the speaker's right hand also begins to be raised from the previous resting position shown in Frame 15. Frame 17 shows the further development of the movement of the right hand initiated in the previous Frame. In Frame 17, the right hand is raised to a height that is comparable to that of the left hand so that the two hands together enact an up-down flourish that is synchronised with the word *svarer* ('answer' – verb). The right hand movement is coordinated with that of the left to portray the 'dialogue' between the calling of the mothers (left hand) and the answering of the lambs (right hand). In Frame 18, the speaker's two hands begin to converge in synchrony with the first syllable of the word *lamman* ('the lambs'). In Frame 19, the two hands briefly converge, as the movement shown in Frames 18–19 in synchrony with the second syllable of *lamman* enacts the further development of the 'dialogue' between sheep and lambs initiated in Frame 16. Frame 20 initiates the final phase of the gesture under consideration here. In synchrony with the words *skal de* ('they will'), the speaker's hands continue their movement trajectory so that they pass each other and cross over. In Frame 21, the hands, in their respective semantic roles of mothers (left hand) and lambs (right hand), separate in synchrony with the word *finne* ('find') in the process

of being separated and then of finding each other when the hands again cross over in synchrony with the word *hverandre* ('each other') in Frame 22. Frame 23 completes the transcription of this excerpt. In Frame 23, the speaker's hands perform a complex sequence of movements that conclude the development of the dialogue between sheep and lambs: the two hands separate in synchrony with the words *ikke sant* ('you know') in a movement similar to that shown in Frame 21; they then converge and overlap with the left hand held above the right hand (Frame 23), and they are then retracted to a resting position close to the speaker's abdomen on the conclusion of this gesture.

Further analysis of the interview excerpt with Interviewee 1 is provided in subsection *4.5 Extracting and analysing cultural themes in multimodal transcription data* below.

4.4. Sample analysis 2

This subsection is divided into two parts, one presenting observations on all four interviewees' interpretations of Image No. 2 (cf. Figure 2 below), and one treating Interviewee 4's dealings with Image No. 2 in depth (in excerpt). For the verbal transcript of the latter (in the Norwegian original plus English translation), see Appendix 2.

4.4.1. General observations

Figure 2 below shows the image that was perceived as the most ambiguous image in the display material in the pilot study. The image shows an adult female zookeeper looking at three socialised wolves in the Polar Zoo while they are play fighting, with one wolf demonstrating dominance physically and by displaying teeth.

One interviewee indicated that the human to the left was an adult male, two interviewees simply identified a human/human observer, whereas a fourth interviewee said it was a child. Their assumptions on whether or not the human person in the picture was a zookeeper, a zoo visitor, or something else also differed. Finally, not all interviewees were sure how many animals are in the picture or whether all of them were wolves – alternative explanations included "prey", and "possibly a fox". Two of the interviewees reported that the wolf that is visible frontally was looking at the human person, another interviewee reported that this wolf was looking at some other wolf in the picture. Finally, some of the interviewees were not sure whether the wolves were playing or fighting "for real" – though one interviewee concluded that since there was a child nearby, they were likely just play fighting.

Figure 2. Image No. 2 in the display materials used in the pilot study. Photo: Morten Tønnessen.

Table 3 gives an overview over the interviewees' different interpretations of Image No. 2.

Table 3. Different interpretations of image of fighting wolves.

Inter-viewee	**Interpretation**	**Sample citation (in English translation)**
1	A child and two wolves, probably young, that fight or play.	"Are they fighting, or playing?"
2	A human observer and at least two non-wild wolves that fight or play, plus possibly a fox.	"At first I thought that one was a fox."
3	A human and two wolves that play – or a wolf and a prey. The wolf on top gazes at the human.	"There's a human there, too – it can't be that dangerous."
4	A male adult human and a wolf, plus possibly one more wolf, the third one possibly being dead.	"So, is that a wolf that has been shot? Lying there. Because if it is a wolf, then the way it is lying is very strange […] But […] the main point […] must be the relation between the man and – I assume it is a man – the man and the animal."

4.4.2. Multimodal Transcription of Interviewee 4 – preliminary details

Participant: Interviewee 4; Pilot Study
Location: Kristiansand
Display Material Responded To: Visual Image No. 2
Event Type: Perceptual Problem Solving
Resources: Bodily Orientation and Body Posture, Gaze, Hand Point, and Verbal Patterns
Duration: 18.100 seconds (18 seconds and 100 milliseconds)
The Interviewer (I) is located on the left; Interviewee 4 (I4) is on the right.

4.4.3. Multimodal Event Transcription; Interviewee 4; Back camera 1

Frame 1: 00:02.100

Onset of orientation to display material on screen
I and I4 maintain initial orientation to the image on the screen

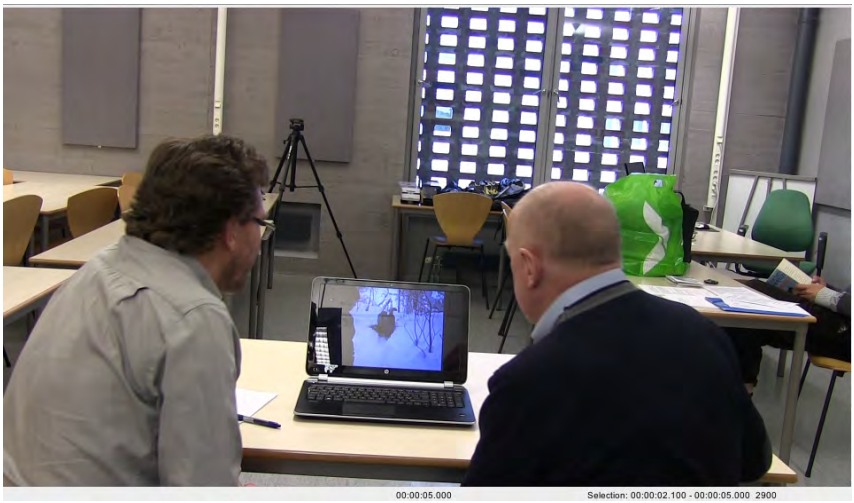
Frame 2: 00:02.200

I: initiates postural shift: moves upper body towards screen;
I4: maintains original posture

Frame 3: 00:03.000 – 00:04.000

I4: changes posture and moves towards screen
I: *Hva ser du her?*

Frame 4: 00:04.000 – 00:05.000



I4: *Ja, det var litt vanskelig å se …*

Frame 5: 00:05.00 – 00:11.000

I4: *… Det er et menneske der, og så, hva er det for noe han har i, hva er det foran der*
I: *mm*

Frame 6: 00:11.000 – 00:12.000

I4: points to animal on screen I4: *Kan du si det?*
Frame 7: 00:12.000 – 00:14.000

I4: retracts point I4: *er det en ulv til, eller hva er det for noe?*

Frame 8: 00:14.000 – 00:16.000

I: *Ja, altså, det kunne jeg ha sagt, men jeg vil heller høre dæ …*
I4: *Nei altså, jeg*

Frame 9: 00:21.100

I4: *… skjønner… jeg ser jo bare at de flerrer – at ulven*

4.4.4. Analytical discussion of the transcription

The transcription data of this episode shows Interviewee 4's orienting to some of the perceptual difficulties which Image No. 2 (cf. Figure 2) presented for him.

In Frame 1, Image No. 2 has just been displayed on the screen by the Interviewer. I and I4 are oriented to the display material but have not yet begun actively to engage with it. In Frame 2, I adjusts his posture by leaning towards the screen. I4 maintains his initial posture. In Frame 3, I4 begins to move towards the screen as I asks the question *Hva ser du her?* ('what do you see here?'). In adjusting his posture in response to I, I and I4 achieve interactional synchrony. Frames 4 and 5 show I4 attempting to interpret the display material and appealing to I for clarification. In accordance with the established protocol, I declines to provide any clarification and further prompts I4 to describe what he sees. In Frames 6 and 7, I4 points to one of the animals in the display material and asks I to tell I4 what it is. At the conclusion of this attempt, he retracts his point gesture (Frame 7). Frames 8 and 9 feature I4 scrutinising the display material quite intensively as he makes a further attempt to resolve the difficulties of interpretation already mentioned. While maintaining the same overall postural orientation, the micro-movements of his head evidence his continual visual scanning of the displayed scene as he comes up with a first interpretation in Frames 8 and 9.

4.5. Extracting and analysing cultural themes in Multimodal Transcription Data

An important aspect of the research project outlined in this chapter is the explication of the cultural themes of the data that is obtained from the MEA. This approach requires reducing the transcription data to its essential cultural themes as accurately and as completely as possible (Ratner, 2002: 168). In this section, the excerpt from Interviewee 1 will be used to illustrate this approach.

As Ratner explains, the first step in this process is the identification of the meaning units in the data. Meaning units are concrete rather than abstract. They may consist of a single word or a combination of several words. They can be a part of an utterance, a whole utterance, or several utterances combined. Meaning units have no fixed relationship to specific lexicogrammatical units of language or to any particular linguistic level though they are of course realised by linguistic (and other) units and combinations of units. They are not confined to verbal patterns but may also combine these with, for example, gesture.

For example, Interviewee 1, in the excerpt analysed, makes extensive use of verbal patterns in combination with hand-arm gestures. A meaning unit, as the name suggests, expresses a single idea or theme. It is both a psychological unit (it is salient and significant for the speaker) and a cultural unit (its content derives from the cultural system of the speaker). Typically, an interviewee's talk combines a number of different meaning units in various ways. Meaning units

are "coherent and distinct meanings" (Ratner, 2002: 169) that are embedded within the interviewee's talk. The identification of meaning units requires careful interpretation of the data, including a precise understanding of how meaning units relate to each other in a particular interviewee's talk. Table 4 identifies the meaning units of the excerpt from Interviewee 1 presented in the MEA in 4.3.2.

Table 4. Meaning Units and Central and General Themes in Excerpt from Interviewee 1.

Meaning Units in Transcription	**Central Themes**	**General Themes**
nå har jeg mest erfaring med villsau	Personal experience of wild sheep (in contrast to farm sheep)	Knowledge and insight of the sheep herder
de lager ikke så mye lyd hvis ikke det er et eller anna – galt, da + Gesture	When wild sheep vocalise: responsiveness to perceived trouble	Agency of sheep
når vi tar + Gesture	The sheep herder's interventions in the life of the herd	Human agency + management of sheep herd
når vi skiller lamman og sauane + Gesture	The sheep herder's interventions in the life of the herd	Human agency + management of sheep herd
da er det veldig mye lyd i de, da driver de mødran og roper og – svarer lamman + Gesture	When wild sheep vocalise: mothers and lambs calling each other	Agency of sheep
skal de prøve å finne hverandre + Gesture	Lambs and their mothers can find each other	Agency of sheep

The next step in this process is to reduce the meaning units to a number of Central Themes that represent the psychological significance of the meaning unit (Ratner, 2002: 168–169). This involves paraphrasing the meaning units identified in the analysis. The identification of central themes requires sophisticated contextualisation and interpretation of meaning units. For example, when Interviewee 1 says, "*nå har jeg mest erfaring med villsau*", she is doing more than making a simple factual statement about her personal experience of wild sheep. In the context of the interview, her utterance is a response to what she has just heard in the audio file featuring an ewe and its lamb calling to each other. She has understood that these are farm animals. Her utterance implicitly contrasts her interpretation of the audio file with her own experience as a herder of *wild* sheep. In this sense, her utterance functions as a category contrast, i.e., it implies a distinction between the two categories of sheep – farm sheep and wild sheep – and signals that the speaker is better able to draw upon her experience as a herder of wild sheep to discuss sheep calls in contrast to the farm sheep featured in the audio file.

Another example is the meaning unit "*når vi skiller lamman og sauane* + Gesture". Interviewee 1's use of the first person plural pronoun *vi* ('we') indexes her membership of a particular social group – herders of wild sheep. In this meaning unit, the interviewee is referring to a particular cultural practice of the sheep herder – the practice of separating lambs from their mothers – that she is familiar with as a member of this group. Moreover, the gesture that co-occurs with the wording (see 4.3.2, Frames 11–13) imagistically portrays the herder's action of separating sheep and lambs. Interviewee 1 makes extensive use of complex gestures in the excerpt analysed. In our view, this reflects on how her meanings are grounded in the rich, embodied experience and practices of her life as a sheep herder.

Central Themes are grouped into a more encompassing category of General Theme. General Themes express more abstract meanings that a number of different Central Themes are interpreted as having in common. In Table 4, five Central Themes are identified in the second column. These five Central Themes are further grouped into the three General Themes in the third column of Table 4. For example, three Central Themes in this column are grouped under the General Theme of "Agency of Sheep" in the third column. The General Theme "Agency of Sheep" serves to show how, in the interviewee's meaning system, sheep manifest their agency in a number of different ways, including their calls to each other, their ability to sense and signal trouble, and their ability to find each other when lambs are separated from their mothers.

At all levels of the theme analysis proposed here, it is important that the themes identified can be linked concretely to the cultural activities, artefacts, and concepts that shape the meaning systems of the interviewee (Ratner 2002: 174). In the case of Interviewee 1, Table 4 shows how her Recount embeds activities and practices of the sheep herder in ways that make salient the interaction of humans and sheep and the different ways in which human and sheep agency are manifested in and through this interaction.

5. Discussion

This study of human perceptions of wolves and other animals has focused on perceptions of animal behaviour and, to some extent, of human–animal interaction/relations. The researchers conducting the pilot study had background information on actors in the various display materials, including information on the species of involved animals. In three cases – two images and a video clip – one of the researchers, Tønnessen, had photographed/filmed the depicted/filmed situations and, therefore, had particularly salient background knowledge. Throughout, the background information acquired by the researchers enabled them to assess the factual/erroneous character of the interviewees' interpretations.

As the analysis of the four interviewees' interpretations of Image No. 2 demonstrated, images can be highly ambiguous, and even highly educated people can make erroneous assumptions. All interpretations are fallible. People often try to interpret images and other mediating items by making use of contextual information. In this case, the identification of the human observer as either male or female, and as either an adult or a child, played into how the interviewees interpreted the depicted situation. Furthermore, the proximity of the human observer and the wolves was taken by some to imply that the wolves could not be wild. Another example of the use of contextual information is represented in some interviewees' statements that since this was a study on wolves, they assumed that the depicted animals in a specific image were wolves. It would make for an interesting comparison if a similar perception study with the exact same display materials was conducted, with the only difference being that the study was presented as a study on dogs. Quite likely, some of the depicted animals would then be perceived as dogs rather than as wolves, and their behaviour would probably in some cases be interpreted differently.

As the preliminary analysis of interviews conducted at the three other field locations show, people's ability to correctly assess situations mediated via audio clips, images or video clips depends on their familiarity with the featured study animals and/or shared local knowledge about these animals.[3] Everybody's an expert on one animal or another, but no one is an expert on all animals. The central role played by familiarity with the various study animals is demonstrated in the analysis of Interviewee 1's interpretation of Audio Clip No. 3 (a bleating ewe and lamb). As the analysis shows, the interviewee attempts, in a narratively complex manner, to draw on her experience with wild sheep husbandry in her interpretations of the bleating (likely domestic) sheep. In this case, the animal's vocalisations are interpreted by the interviewee by relying on her own experience.

This chapter has attempted to demonstrate the feasibility of Multimodal Event Analysis of video recorded interviews involving display materials. The two sample analyses have focused on one instance of a Recount of past experience and one instance of Perceptual Problem Solving, respectively. Although perception concerns much more than just recounts and problem solving, these are central themes. As we have indicated, human perceptions of animals are based among other things on direct encounters with animals, on recounts of such encounters, on associative guesswork, and on general knowledge acquired as part of a local culture or individually.

We believe that the research method described in this chapter is suitable for studies of human perceptions of animal behaviour, animal representations, and

[3] As we have seen, professions and hobbies are often reliable indicators of people's familiarity with various animals. On a larger scale, the familiarity of local people in an area with specific animals is often characteristic of the culture as such. In fact, any culture can be partially described by describing its significant human–animal relations.

human–animal relations (including attitudes to animals and to conservation policies). In this context, non-verbal communication plays a central role in two respects: first, in images (postures, indicated body movements, facial expressions, etc.) and video clips (postures, body movements, facial expressions, etc.) constituting part of the display material, and second, in the video recorded interviews where interviewees try to make sense of what they see and hear. This points to the obvious commonalities between human and animal communication, which are often overlooked in mainstream science. Given the dynamic nature of the methods applied, the methodology presented and exemplified here is likely to be particularly suitable for analysis of novel and little-known objects and relations. The level, or depth, of these studies can be tailor-made, as it were, depending on whether the studies are initial and general, or advanced and detailed.

In conclusion, this chapter proposes a set of interrelated methods for deepening our understanding of the cultural meaning systems that are articulated when interviewees express their perceptions and experiences of wolves and some related study animals. Using a small-scale sample of the interviews that were video recorded during the pilot study that was conducted in Kristiansand, this chapter proposes and illustrates a triangulated method of analysis for identifying, analysing, and interpreting relevant meaning units and their wider cultural significance. The triangulation of semi-structured interviews, Multimodal Event Analysis (MEA), and Cultural Thematic Analysis (CTA) yielded a useful and comprehensive tool for the investigation of the interview data and for the development of a scientific approach that will be able to shed light on the meaning orientations of different categories of interviewees in relation to the wider cultural, societal, and political factors in which their meanings are embedded.

Acknowledgments

This work has been carried out thanks to the support of the research project Animals in Changing Environments: Cultural Mediation and Semiotic Analysis (EEA Norway Grants/Norway Financial Mechanism 2009–2014 under project contract no. EMP151). We thank Laura Kiiroja for assisting us by cataloguing video recordings, and the University of Agder for providing us with localities in which we conducted the pilot study.

Compliance with ethical standards

This study is in conformity with required ethical standards for qualitative research in the social sciences. The interviewees were informed about the aims of the study, and interviews were conducted with the informed consent of the

respondents. Prior to the pilot study, the project was reported to Norway's Data Protection Official for Research, based at the Norwegian Social Science Data Services (NSD). The information letter distributed to interviewees was revised in accordance with feedback from Norway's Data Protection Official for Research.

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APPENDIX 1. Transcription of excerpts from interview 1

Back camera 1, excerpts

The original, in Norwegian:
INTERVIEWEE 1: Eh, altså, nå har jeg mest erfaring med villsau.
INTERVIEWER: Mhm.
INTERVIEWEE 1: Og de lager ikke så mye lyd hvis ikke det er et eller anna – galt, da – sånn for eksempel når vi tar, når vi skiller lamman og sauane,
INTERVIEWER: Mhm.
INTERVIEWEE 1: – da er det veldig mye lyd i de, da driver de mødran og roper og – svarer lamman, skal de prøve å finne hverandre.
INTERVIEWER: Ja.

English translation:
INTERVIEWEE 1: Eh, so, I have most experience with wild sheep.
INTERVIEWER: Mhm.
INTERVIEWEE 1: And they don't make so much sound unless there is something – well, wrong – as for instance when we take, when we separate the lambs and the sheep,
INTERVIEWER: Mhm.
INTERVIEWER: – then there is a lot of sound in them, then the mothers are calling and – the lambs answer, they will try to find each other.
INTERVIEWER: Yes.

APPENDIX 2. Transcription of excerpts from interview 4

Back camera 1, excerpts

The original, in Norwegian:

INTERVIEWER: Hva ser du her?
INTERVIEWEE: Ja, det var litt vanskelig å se. Det er et menneske der, og så, hva er det for noe han har i, hva er det foran der.
INTERVIEWER: Mm.
INTERVIEWEE: Kan du si det? Kan du si det – er det en ulv til, eller hva er det for noe?
INTERVIEWER: Ja, altså, det kunne jeg ha sagt, men jeg vil heller høre dæ …
INTERVIEWEE: Nei altså, jeg skjønner… jeg ser jo bare at de flerrer[4] – at ulven
INTERVIEWER: Ja.

English translation:

INTERVIEWER: What do you see here?
INTERVIEWEE: Yes, it was a bit hard to see. There is a human there, and then, what is that that he has in, what is that there in front.
INTERVIEWER: Mm.
INTERVIEWEE: Can you say that? Can you say what – is that another wolf, or what is it?
INTERVIEWER: Yes, so, I could have told you, but I would rather hear you …
INTERVIEWEE: No, so, I see …. All I see is that they are tearing – that the wolf
INTERVIEWER: Yes.

[4] The interviewee says "flerrer (tenner)" [tearing teeth] but likely intends to say "flekker (tenner)" [displaying teeth].

Shared human–animal households: the examples of Nordic bronze age longhouses and Estonian rehi houses

Kadri Tüür, Kristin Armstrong Oma

1. Introduction: the scope of the article

In this article we compare situations across time and space in which humans and animals live under the same roof. The main focus is on the use of space as a backdrop for human–animal interactions. By comparing data from different time periods, 19th century Estonia and the bronze age in Norway respectively, we seek to answer the following questions: 1) Where were the animals placed in the house, and how was their space organised? 2) How did the built structures allow for interaction between humans and animals? 3) What does this reveal concerning the pragmatic considerations of humans regarding animals (and vice versa)?

On a more detailed level of inquiry, we also ask, is it possible to discern the rationale behind the spatial layout of animals in the houses? Upon which principles is it based? Is it based on increased economic and/or pragmatic benefits, or on animal welfare, or on religious considerations, or on the ontological status of the animals – or on a combination of these factors? Is there a seasonal dynamics inherent to the placing of animals in the house?

In order to track human–animal relations in the household, we are comparing ethnographic evidence from Estonia and archaeological evidence from Norway. The two case studies differ in time and geography, and the situations are not directly comparable. However, by looking at them together, we hope to highlight the specific relationality between humans and animals that flavoured each of these two societies. We present a comparative analysis of the spatial distribution of the archaeological findings of animal remains in the Norwegian Bronze Age longhouses and of the ethnographic descriptions of 19th century Estonian farmhouses (rehi)[1]. We have rich oral and written sources available in the Estonian

[1] *Rehi* is an indigenous word denoting an ancient Estonian-Livonian type of farmhouse where the functions of living, grain-drying and animal shelter were gathered under one roof. In the following, *rehi* is used as a term for reasons of shortness and clarity.

case study and thorough archaeological data to account for the Norwegian case study. The Estonian case study, based upon historical sources, gives different insights in comparison to the archaeological data. Historical sources are descriptive and can, beyond outlining an understanding of and interaction with aspects of the world, render insights into the minds and motivations of people. The material culture and its context that make up archaeological case studies are, however, direct and physical traces of practice, of what people actually were doing and how they were doing it (Barrett 2000). We ask whether the rich description of the historical sources of the Estonian case study could help us to interpret the Norwegian archaeological data, and vice versa. Based on empirical data, is it possible to understand the underlying positions in society of different animal species in these two cultures?

Keeping animals in the same house, under the same roof – the human living quarters – is a custom that persisted in Estonia until the end of the 20th century when structural changes in the economy put an end to individual, small-scale farming. Therefore, the article works from recent times towards greater time-depth in the more distant past. By comparing the knowledge and the practices of keeping animals in human living quarters to the archaeological evidence, we may be able to point out which common spatial arrangements have proved viable in different regions and over longer periods of time. These may also cast light on human–animal relationships at large, as both domestication and communication are always processes that work both ways (Westling 2014; Sebeok 1990).

Spatial analysis and ecosemiotics serve as methodological tools for interpreting our data sets.

2. Methodological framework: eco-field, umwelt, habitus and multi-species ethnography

In the case of human–animal interactions, we deal with what can be regarded as hybrid objects (see Latour 1993; discussed in detail in the second chapter of the present monograph). When different species interact, as it happens in bronze age longhouses and in recent rehi houses, zoosemiotics can be used to describe and understand the relationships and the communication that takes place. Within close co-habitation, a new type of human–animal community is formed that, in turn, results in a special type of *eco-field*. The term, as launched and explained in Farina and Belgrano 2006, denotes meaningful patches of landscape that are relevant to certain species in regard to their umwelt (see outline below), perception, and life functions, such as obtaining food or delineating home territory. Eco-fields are formed in the combination of the physical features of a landscape and of the particular needs a representative of a species has to meet. Meaning and meaningful ties between animals and their environment form the core of the notion of eco-field. The concept of eco-field allows for a description

of spaces where different species meet and helps to pinpoint the grounds for conflicting relations between the species.

Traces of these meaningful ties and the associated species interactions can be observed in eco-fields that manifest as semi-natural environments, traditional agriculture, literary creation, etc. Studying these hybrid phenomena takes us to the sphere of ecosemiotic research and its focus on species', including humans', interactions with each other, as well as to the resulting interpretative communities where the environment plays an important role. In our case, we mostly deal with the built environment that shapes human–animal interaction.

As pointed out in the introductory chapters of the present monograph, analysing spatial organisation and the use of the space or landscape of a certain species is one of the basic approaches of the semiotic study of animals. Looking at the spatial organisation of inter-species relations induces the question: which features and objects have a meaning for an animal, and what is their meaning in communication situations? Or, in a wider perspective that necessarily also embraces the human species: where do our *umwelten* overlap with those of other species – in our case, with domesticated vertebrates? What is the common ground that enables humans to live immediately side by side with other animals? What are the biological, social, economic, and spiritual benefits and shortcomings of such a life? The umwelt theory as initiated by Jakob von Uexküll (in English, see Uexküll 2010) enables us to see all species, including humans, as complex agents with species-specific receptor organs and a certain behavioural repertoire for adjusting themselves to the surrounding environment.

In umwelt analysis, four basic functional cycles (as elaborated in Tønnessen 2011: 44) are taken into account in the discussion of the position of domestic animals. These functional cycles are related to food, enemies, medium/environment and partners/sex. They also provide a common ground for comparisons between the umwelten of different species.

As Thomas Sebeok (1994) points out, most animals, including humans, possess by and large the same type of communication channels (visual, audial, tactile, olfactory), although animals do not exchange signs that are untied from the immediate context of the communication process. This enables us to make sense of a great deal of animal behaviour and animal communication, especially in domesticated animals. Increasingly (although probably to a little extent early in the domestication process), they have been bred to be tame and predictable, shaped to suit the needs of humans. In turn, they have also shaped humans to meet their needs related to livelihood and well-being. Opting to live with animals has a profound impact on the lives of humans, as animals through their demands of being tended and taken care of create specific patterns of living in the human society. Humans and animals become naturalised parts of each other's experience of life. This implies that not only do humans domesticate animals but humans themselves are to a certain degree domesticated by animals.

The eco-field, and also the umwelt, can in the context of our case studies be linked with Bourdieu's theories of practice and *habitus*. Bourdieu (1977, 1990[1980]) outlines *practice* as that which constitutes how life is lived, according to structuring principles that together form the habitus of society. Shared living spaces for humans and animals are also performed as sets of practices. Bourdieu, somewhat densely, described habitus as being in its own nature an assemblage of dormant dispositions; it is constituted to, and oriented towards, practice, structured within structuring dispositions; it is orchestrated, but without a conductor (Bourdieu 1990: 52–53). More precisely, it is "systems of durable, transposable dispositions", and "the mode of generation of practices" (Bourdieu 1977: 72) within any society. The habitus is the everyday actions that we carry out, the choices we make without reflecting on them, and the way that our past actions are carried into the future. It follows that, for example, members of a group habitus organise their life according to their embodied dispositions, which are, simultaneously, experienced history inscribed within their bodies and the templates that structure the way future practices are generated.

Vital within the argument of this chapter is that the habitus provides the fundamental framework within which the human–animal relationship is situated – habitus is formed in the day-to-day interactions between all participants. Within this setting, practice is anchored by structuring principles, such as architectural layout, activities, material culture and agents (both humans and animals). Structuring principles are a way of organising one's actions and dealings with the world within a framework (Barrett 2000). Rather than a passive form of structuralism, it is a system of active categories that forms a drive in which agents can operate in their own life-space and with the world at large (Giddens 1984). Life-space here denotes the choice of living arrangements and the structuring of these, such as whether to live with animals or to live apart from them – here termed shared or non-shared life-space.

What we aim to achieve in this chapter is *multi-species ethnography* (see Kirksey, Helmreich 2010). This entails regarding other species not merely as biomass (*zoe*), but as *bios* – as living subjects with their individual and unique lives. Multispecies ethnography works in the contact zone of humans and other living beings, where "encounters between *Homo sapiens* and other beings generate mutual ecologies and coproduced niches" (Kirksey, Helmreich 2010: 546). In the case of the Estonian material, all the main sources stem from an ethnographic approach. Spatial analysis of the humans' living space has been a topic for ethnographers for several decades. The question of how animals are positioned in regard to human locations and activities has not received much attention so far (but see Armstrong Oma 2007, 2013a,b for such studies within archaeology). It has been agreed that the location of objects and people are loaded with semiotic significance (see, for example, Lagopoulos, Stylianoudi 2004), but domesticated animals have often been overlooked in the discussions of human

spatial arrangements. In the present article, we attempt to look at the locale and use of space, and therefore also at the position and the semiotic significance of the domestic animals first through human eyes. Then we want to take the study one step further and ask, how might the animals themselves perceive the situation of living under the same roof with and, in some cases, even in the same rooms as the humans? The latter question is asked within the framework of understanding animal umwelten as species-specific forms of perception of, and reaction to, the environment. At the same time, much of the corporeal basis for establishing the connections with one's surroundings is shared by humans and other animals. Over the course of evolution, domesticated animals have learned to know, and in some instances most probably even appreciate, the human umwelt. Therefore, in our understanding of the multi-species ethnography, humans are regarded as one among the many animal species who act as agents in a traditional small-scale farming situation. Longhouses and rehi are sites of significant importance that enable these relational stories to unfold.

3. Material framework: the rehi houses in Estonia

The rehi houses are used for living by the Estonian rural population even today.[2] The construction of the rehi houses ceased in the 1930s, as the structure of the economy and people's living habits changed in the course of the industrialisation and urbanisation of Estonia. The rehi as a house type has, probably for more than a millennium by now, been known in the territories that presently form Estonia and Northern Latvia. Ethnographers agree that this type of house is the result of a long-term local development that is related to the development of agriculture. However, not much archaeological evidence remains of the houses themselves, as they are constructed of logs that decay without leaving noticeable traces in the ground. The rehi houses have developed because of the need to dry grain for preservation in a dry and warm place in autumn. In the neighbouring areas, grain-drying houses are always built separately from the living houses, but consistently in this region, these functions have been joined under the same roof (Pärdi 1998: 282). In winter, the threshing ground has been used as a seasonal shelter for animals.

In its earliest stages of development, the rehi consisted of a larger rectangular wooden construction, inside of which was another rectangular construction that also included a stove (Ränk 1939; Peterson 1967).

Rehi (see Fig. 1), the traditional Estonian peasant dwelling house, consists of three main parts, namely:

– *rehetuba*, the heatable family space where grain was dried;
– *rehealune* (threshing barn), the non-heatable part of the house where grain

[2] See the rehi house database at https://register.muinas.ee/public.php?menuID=rehemaja.

was threshed. Carts and sleighs were kept there along with the draught animals;
– *kambrid* (chambers), clean rooms exclusively for human use; a later development that spread during the 19th century.

Rehetuba had three doors, leading to 1) threshing barn; 2) chambers; 3) outside (Pärdi 1998: 274). These directions point to three semiotically relevant realms that radiate, as it were, from the central working-room: the threshing barn where the most important tools and animals were kept and where the crops were processed, the intimate family space, and the open grounds surrounding the farm where most of the work related to sustenance was done. The construction of the rehi efficiently maps the spatial organisation that was significant to a traditional peasant household. This forms the eco-field of all the household members belonging to different species and is a framework for their habitus. The particular needs of all the inhabitants of the house are embedded in the physical structure of the house and into its inner logic of connections.

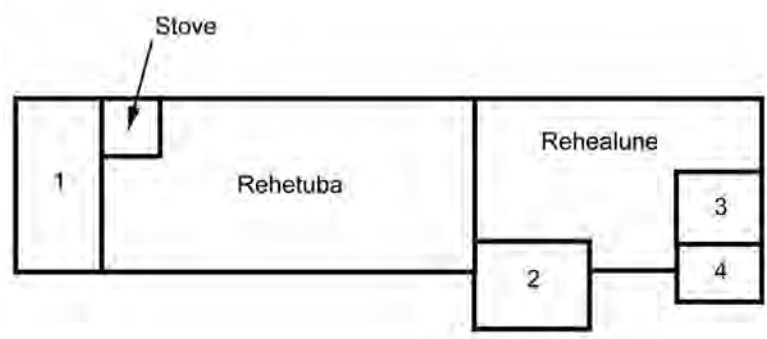

Figure 1. Ground plan of a typical rehi house from Southern Estonia. In addition to the main room (rehetuba) and the threshing ground (rehealune), sheds for animals were attached to the walls of the rehi house (1 – shed for cows and calves; 4 – hen coop). A separate stall for horses can be seen inside the house, located at the threshing ground (3). A chaff loft was also attached to the outer wall of the rehealune (2). Re-drawn from Pärdi 1998: 276; based on the collection of ethnographic drawings in the Estonian National Museum.

The rehealune, the threshing ground, usually has two wide doors or gates in opposite walls. It was convenient to drive the horse-drawn carts of grain through these for unloading during the harvesting. Here the grain was unloaded, threshed, and winnowed to clean it of chaff. After the processing of grain was done, the big rehealune space was used as a shed for domesticated animals, especially horses and pigs, but in Western Estonia, cattle and sheep were also included. The animals' winter fodder, comprised of chaff and hay, was stored under the roof of the rehi house, immediately above the rehealune where the animals stayed in

winter. This served as insulation as there were no other heating options than the heat produced by the animals' bodies (Jaagosild 1967). For the same reason, litter was stored alongside the walls of the rehi, which also explains the placement of the chaff lofts: in addition to practical considerations, it also matters that they served as temporary insulation in case of cold winter weather (Põllu 2005: 224).

Depending on the season and the need, the rehealune could be used as a storage space for carts and sleighs, harnesses, etc. During big festivities, such as wedding parties or the completion of communal work, the rehealune could be emptied of stored items, cleaned, and turned into a dance hall. In summer, when most activities took place outdoors, the family's eating table and other bulky items could be placed in the rehealune (Viires, Vunder 1998; Põllu 2005).

Aganik, or the small chaff loft, was usually located at a nook between the northern back wall between the rehealune and the rehetuba (Troska, Viires 1998: 279). Aleksei Peterson, a long-time head of the Estonian National Museum, pointed out the practical need for such spatial arrangements: as horses and cows were kept in the rehealune during the cold season, it was convenient to keep a certain amount of their food and 'bedstraw' close at hand. As aganik was a remarkably widespread element in the construction and the spatial division of the rehi, Peterson concluded that keeping animals in rehealune would have had to be a regular practice, as it left its traces in the traditionally built environment. Aganik is connected to the seasonality of the shared living: in summer when animals were let out to graze in the open, they stayed in other buildings, and aganik could be used for other purposes, such as temporary storage (Peterson 1967: 21).

Little attachments could be erected for pigs and smaller animals against the outer walls of the rehi. In cases of extreme weather conditions, animals could also stay inside the main house at different locations. Details of such an organisation are discussed at length below.

4. Material framework: three-aisled houses in early bronze age Scandinavia

The bronze age longhouses from northern Europe could be termed post-domestication household arenas. These houses provided for animals that were fully domesticated and came from a long line of domestic animals, stretching back thousands of years in time. The post-domestication household arena thus signifies the physical environment where people and animals lived together. We suggest that the built environment provided pre-conceived choices determining how relationships could be performed within the household arena (see also Armstrong Oma 2007, 2010, 2013a). Those choices were probably made with particular reference to human–animal relationships, and created a framework for the inherent habitus.

We outline an argument to propose that by investigating the spatial organisation of the material remains of the household, it is possible to extrapolate the physical meeting points between humans and domestic animals. Further, we suggest that these meeting points could render clues towards the understanding of human–animal relationships.

In the following, we examine how human and non-human membership in bronze age households came into being, and examine the ontological status of these beings. Specifically, we look at case studies in the area of Jæren in southwestern Norway, since a large number of house remains have been excavated in this area, with datasets that have been thoroughly examined and are well presented (Horve 2009; Juhl 2001; Løken 1987, 1988, 1989, 1998, 2003; Pilskog 1998a, b; Soltvedt *et al.* 2007). Of particular interest is a development in the way the house was built and shaped that took place over a shorter period of time, more specifically a change that concerned how the layout of the house was designed. Looking at developments over time makes differences evident.

In the early bronze age, a monumental change in the planning and building of houses happened that led to a transition from two-aisled to three-aisled longhouses (see Figure 2, the two top left house plans are two-aisled houses, and all the others are three-aisled longhouses). Architectonically, the construction of the longhouse changed from three rows of post-holes to four rows that provided the three-aisled longhouse with three long rooms lengthwise. This architectural change is believed to be associated with a change in how animals were kept; they were moved into the three-aisled house and lived in the same house as humans (Årlin 1999; Lagerås, Regnell 1999; Rasmussen, Adamsen 1993; Rasmussen 1999: 281; Tesch 1992: 290). The transition is normally dated to bronze age period II (Montelius), see Table 1 below. Factors that caused this change are not known, nor properly accounted for in the archaeological discourse.

Table 1. The table correlates Montelius' periodic system with radiocarbon dates. Note that transitions are not always clear cut in terms of dating.

Period	Early bronze age I	Early bronze age II	Early bronze age III	Late bronze age IV	Late bronze age V	Late bronze age VI
Time (BCE)	1700–1500	1500–1300	1300–1100	1100–900	900–700	700–500

A common assumption is that a result of the architectural change was the indoor stalling of domestic animals in one part of the house. Some archaeologists (Årlin 1999; Armstrong Oma 2007, 2010, 2012, 2013b; Rasmussen, Adamsen 1993; Rasmussen 1999: 281) have previously suggested that the change happened due to a change in the human perception of domestic animals, leading to their becoming household members that were embedded into the life-space of humans. Thus, a

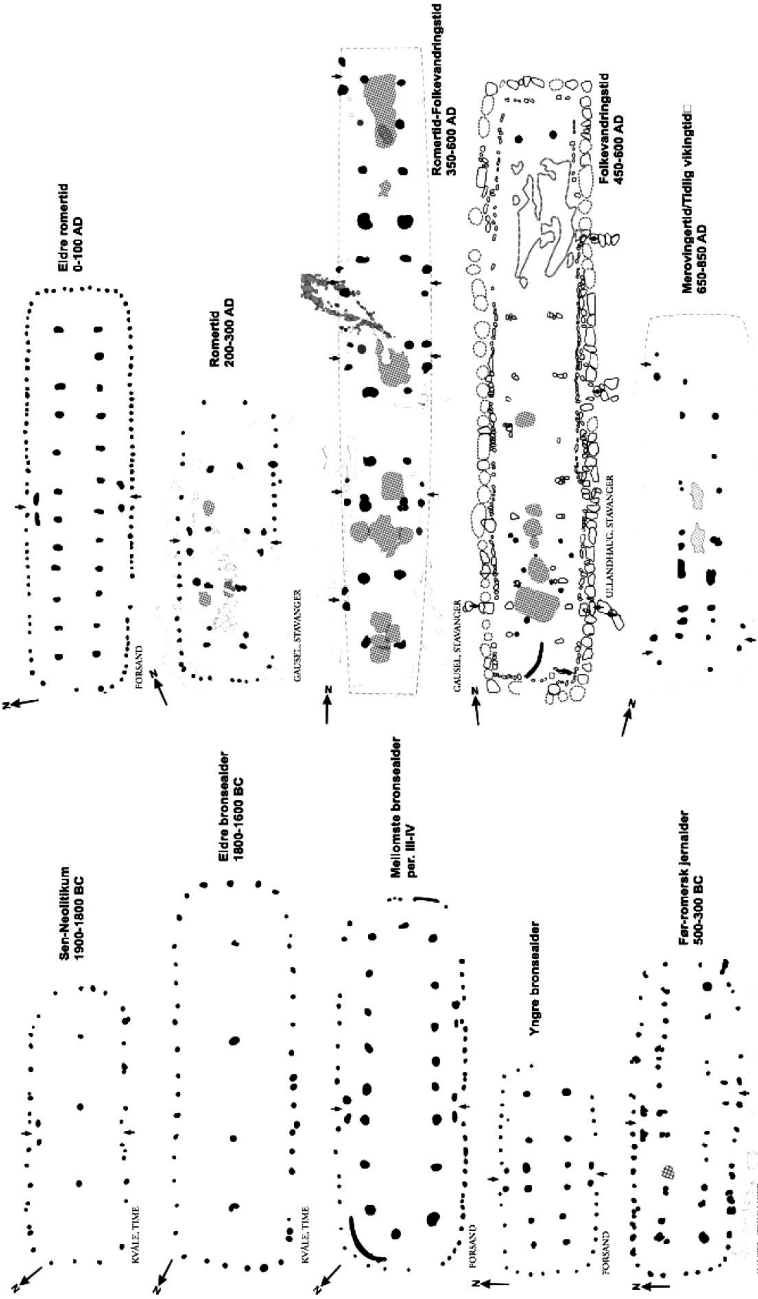

Figure 2. The development of longhouses in Rogaland (Norway) from the late Neolithic until the Viking period, a period that spans 3000 years. Note the transition from two-aisled to three-aisled houses that happened early, at the 1800–1600 / 1600–1400 transition. Figure by Ragnar Børsheim, printed with permission.

more intimate human–animal relationship developed. This is aptly demonstrated by the remains of a house that burnt some centuries later, in which the bones of animals were unearthed in the byre part of a longhouse, Nørre Tranders in Jutland (Nielsen 2002, see Figure 3). The postulated change in perception of domestic animals would also inherently mean a change in their socio-economic status. According to Årlin (1999), household membership for domestic animals entailed that animals were perceived as producers (i.e. as workers, similarly to the farmers themselves) rather than mere products.

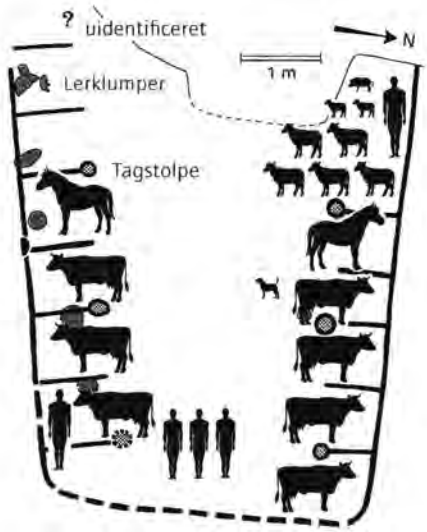

Figure 3. The drawing shows the *in situ* position of the bones of humans and animals in a house that had burnt to the ground. The site is in Nørre Tranders, Jutland (Denmark), and is dated to the Pre-Roman Iron Age. Note the sheep in the top left corner; there are no stalls where they are kept. Lerklumper = lumps of clay, tagstolpe = roof-bearing post, uidentificeret = unidentified. Source: http://www.denstoredanske.dk/Danmarks_Oldtid/Ældre_Jernalder/Bag_hegn_og_palisader_250_f.Kr.-Kr.f/Bonden_og_hans_dyr.

Although evidence from later periods confirms this to be the outcome of the changes in ways of living, it does not account for what instigated the process of granting the animals ontological status as household members. Such changes are most often complex conundrums made up of a number of factors, such as for example new social relationships, changes in environmental circumstances (climate, disasters, vegetation, etc.), novel economic strategies, changes in power structures, and so on.

Two-aisled longhouses are understood as having been for human habitation only, based upon the lack of internal divisions, which signifies that the whole

house was used for human habitation (Ethelberg *et al*. 2000; Tesch 1993). The development of architectonic articulations is rather abrupt, with one type of house – the two-aisled – supplanted by the three-aisled longhouse. The latter was rectangular and often large, varying between 20–50 m long and 7–12 m wide (Harding 2000: 45–48). The transition from two-aisled longhouses with exclusive human occupation to a shared living-space where humans and animals occupied different parts of the three-aisled longhouse occurred in the period between 1800–1500 BCE (early bronze age period I – period II) in northern Europe (Rasmussen 1999). Traces of byres and internal divisions appear ca. 1500 BCE (Fokkens 1999: 36). These houses are probably designed to stall animals indoors (Ethelberg *et al*. 2000: 203), and this is the main reason for why the transfer from the two-aisled house to the three-aisled longhouse is associated with moving domestic animals into the house. Three-aisled longhouses were common in southern Scandinavia, northern Europe, the Low Countries, and at the Alpine lake sites (Harding 2000: 38). The break in the conservative building tradition of two-aisled longhouses has been suggested to represent "radical or gradual changes in society", presumably of an economic, social and political character, according to Tesch (1993: 145). In addition, following Rasmussen (1999) and Årlin (1999) we argue that this shift was, at heart, a change in the ways humans and animals perceived one another, related to each other and shared their world (see also Armstrong Oma 2007, 2010, 2013a, b). These connections are facilitated by the fact that humans' and domesticated animals' umwelten overlap to a considerable degree. The need for (at least seasonal) shelter is one of the central nodes in the web of mutual interests. On an evolutionary scale, the long process of domestication has changed the behaviour of the respective species so that they are more predictable for each other, and a long-time cooperation in agricultural activities has only strengthened this mutual understanding.

In southern Scandinavia, not all longhouses have byres, the houses show great differences, and only a few examples have clearly defined stalls (Rasmussen 1999). Where byres are found, they are introduced as a visible and separate part. All traces of activities in these houses seem to respect the partitions of the rooms; this does not only hold for the internal divisions across the houses, but also for the aisles partitioned by the presence of the roof-bearing posts (Rasmussen 1999: 283). The house types that most likely contain byres are long and narrow houses with partition walls that probably had animals inside in the clearly defined parts of the house interpreted as the byre (see Figure 4). Wider houses with partition walls indicate that larger groups of people lived under one roof. The trend clearly shows that houses with internal partitions where no outbuildings are present contained byres for stalling animals, whereas smaller houses with outbuildings show an arrangement where humans lived in the house and animals lived in the outbuildings (Rasmussen 1999: 285).[3] Thus, to a certain extent, animals were

[3] See also the discussion of outbuildings vs. rehi houses in different regions of Estonia below.

brought into the house in the early bronze age, but other buildings and structures were also a part of animal husbandry management. However, this argument is based upon the often tacit (but sometimes outspoken) assumption that the domestic animals that entered the house were cattle, located in stalls along the long walls (e.g. Rasmussen 1999; Horve 2009; Holst, Rasmussen 2013). The houses with clearly defined stalls do indeed demonstrate that cattle were stalled indoors in some houses. But there are other ways of keeping cattle inside human living-spaces, such as tethering them.[4] And what about the smaller domestic animals, such as sheep, goats and pigs? Penning them obviously makes more sense than stalling them. The distribution of bones and architectural features within the house from Nørre Tranders (see Figure 3) demonstrates that sheep and pigs were not kept in stalls. Comparably, in the Estonian rehi, smaller animals could be penned to one corner of the room also by means of light, temporary wooden hurdles or ladders that were easy to remove (see discussion below). Thus, we argue that houses with stalls are but one way of accommodating animals indoors, and the lack of stalls does not necessarily mean that animals were not housed in three-aisled longhouses.

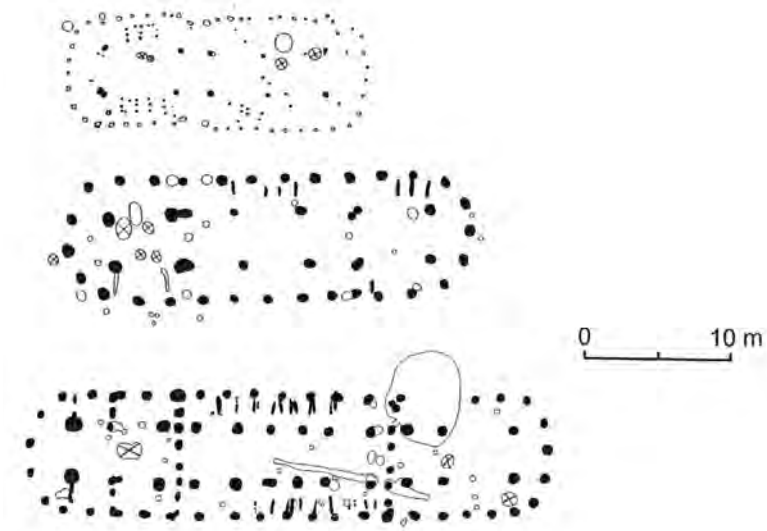

Figure 4. House plans from Jutland (Denmark) with possible byres in one section of the house. Note the traces of stalls – smaller posts or remains of planks between the trestles and the wall posts. After Rasmussen, Adamsen 1993; Mikkelsen 1997; Ethelberg 1995.

[4] Estonian ethnographic material clearly shows that cows could be tethered by means of slings attached directly to the wooden walls; see the following discussion of the placement of each individual animal species in the rehi house.

5. Animals as agents within a shared life-space

To study human–animal relationships, it is imperative to start with the actual physical encounters. Within the frames of archaeology, this means beginning with an understanding of the spaces where the relationship happened. Humans and animals carried out their lives together in and around buildings and in pens and fields in the landscape.

Space is constructed according to preconceived choices, made before the building process proper commences. Preconceived choices give rise to particular life-spaces that are shared by its members – which could include both humans and animals. Life-spaces are, simply, spaces where life is made to happen. As such, it goes beyond Tim Ingold's (2000) concept of dwelling (a term he in later years has abandoned, see Ingold 2011: 12), to rather embody what he has recently termed *meshwork* – the web of life, comprised of entangled, enmeshed and interwoven lines, where primacy is given to the lines in-between the nodes in the network rather than to the nodes themselves (Ingold 2011: 63). Life is lived along lines rather than in points, constantly unfolding, ever surpassing itself. There is no beginning nor end, only a middle. And this middle is "an endless path, along which wayfarers travel" (Ingold 2011: 12–14). Meshwork can be regarded as threads of relationships that allow a focus upon the act of relating, a shift away from perceiving agents as freestanding monolithic nodes. Life-space is a strategy to study relationships, and relationships happen in a meshwork – here, there and everywhere; both in-between and across the walls, fences, and pens that humans build to create the framework for their lives. For example, when a life-space is shared by humans and animals together, their actions become intermingled and flow through space and time together (Armstrong Oma 2007: 161–163). Life-space is thus both an analytical tool and a physical phenomenon.

Life-space can be studied archaeologically by considering architectural choices embedded in excavated remains of houses and their layouts. House plans can reveal structuring principles for the habitus of society, and since these act as anchors for practices, they are fundamental to the construction of space and the choices integrated in that construction.

Friction arises when the preconceived space is put into use and becomes a place of experiences. Out of this tension, relationships grow, sometimes in novel and unforeseen ways. Building upon this, one way of studying human–animal relationships in the past is to look at spatial constructs that accommodate human and animal agents alike. Investigating kinds of spatial designs allows for a consideration of the preconceived notions – dispositions – that underlie social choices. Effectively, spatial constructions would restrict or allow access for human and animal agents, thus regulating the degree of proximity between them, and ultimately create the framework for how their relationships would develop through the process of living together – or not.

As relationships are not static but rather emerge in a processual manner, we need to take into account the seasonal and daily movements of humans and domesticated animals. On the basis of Estonian data, we know that during the growth seasons for vegetation, animals roamed around freely; only the areas where they should not go were separated from the rest of the landscape by means of fences. Herding animals in Estonia was subject to weak regulations for centuries. Animals grazed in big herds (all of the animals of the whole village in one herd) in open spaces that had no other immediate practical use – on coastal meadows, fallows, and village greens. They were looked after by an appointed member of the village community. The practice of keeping domestic animals on fixed premises started to spread only in the 1920s (Pärdi 1998: 106–107). Until then, the human keepers more or less followed in the footsteps of the animals, thus creating meshworks of paths in the landscape (on this topic, see also Gooch 2008: 67–80). Occasionally, these paths would cross with those of wild animals and predators; therefore, the human presence in the herds was of great importance. Whereas elderly people and youngsters were considered suitable for daily cattle herding chores, young and strong men were used for the nocturnal herding of horses. This had to do with the presence of prospective predators as well as with the distance of the herding grounds from human settlements. Human herd-keepers inevitably adjusted to the needs of both domestic and wild animals. These arrangements indicate that animals determined the life-spaces and movement patterns of humans no less than humans determined theirs.

The animal species in Estonian agriculture were of no special breed or pedigree. The animals (cows and horses) were relatively small and patient by nature (Pärdi 1998: 102–103). As the enthusiasts of local breeds have remarked, such qualities facilitated the human–animal interaction and probably also contributed to the close seasonal co-habitation. Animals who fit the "human scale" measurement-wise were probably easier to keep indoors than the larger contemporary breeds of horses or bulky meat cows.

Historically, the mutually beneficial relations between humans and large domesticated mammals, as well as their co-habitation patterns, have emerged hand in hand with the development of agriculture. Sustainable cultivation of land in Estonia (and in Norway) is possible only when fertilisers are given to the cultivated land (Lang 2005: 19–21). Animal manure is the most convenient organic fertiliser. A British researcher of human–animal contacts, Arthur MacGregor, quotes an 18th century source which states that sheep dung "assists all Grounds more than any other" (MacGregor 2012: 464). Even immediately before WWII, manure still accounted for 90% of all fertilisers used in Estonia (Pärdi 1998: 85). This also indicates the importance of domesticated animals in the lives of the rural people up until the middle of the 20th century. In addition to providing organic fertiliser for the fields, animal power was needed for pulling such farming tools as ploughs and harrows, for moving stones and logs, and for moving the harvest from one place to another (Pärdi 1998: 79, 100).

Before the practice of using scythes for cutting grass emerged, animals spent winters outdoors, searching for food themselves. The first documented archaeological finds of scythes in Estonia are dated back to the middle of the 1st millennium (Kriiska 2004: 38). This tool enabled humans to gather extra winter fodder for animals; thus, winter barns were erected for animals on the pastures. As the importance of agriculture rose, the main reason for managing animals indoors and close to the villages was to gather more manure for the fields (Pärdi 1998: 100–101).

The renowned Estonian ethnographer and specialist of rural material culture, Gea Troska, indicates that villages in Estonia started to emerge in relation to agriculture. The size of a farm was calculated according to the land cultivated with one horse or a pair of oxen, i.e. animals were the measurement base for the main economical unit (Troska 1998: 248). A village as a traditional unit (*Dorfmark*) embraces not only the human living area, but also all the cultivable lands used in the economic activities of the village: fields, pastures, hay grounds, forests, and slash-and-burn areas (Troska 1998: 255). Consequently, we may conclude that village grounds inevitably included both animal and human activity; people were sharing the same working and leisure areas as their domesticated animals. This means that a traditional village can be conceptualised both as a life-space and as an eco-field, where the agencies and interests of different species meet.

6. Shared spaces: three-aisled longhouses

A closer look at the wider context of the transition from two-aisled to three-aisled houses is useful to delve deeper into the reasons underlying the shared life-space. During the last 20 years, a stronger emphasis has been placed on social processes in settlement patterns of the bronze age among archaeologists (Armstrong Oma 2007, 2010, 2012, 2013a; Barker 1999; Fokkens 1998; Grön 2004; Olausson 1999; Rasmussen 1999; Roymans 1999; Streiffert 2001; Ullén 1996, 1997; Zimmermann 1999). One such process is the innovation of sharing a living space with animals and the resulting human–animal relationships.

Usually the transition is explained in terms of how everyday life was facilitated for bronze age farmers. The three main functional arguments for stalling animals in houses are (Fokkens 1999: 36):

- climatic reasons – protecting the livestock from the cold winters (Behre 1998: 94);
- providing a means of protecting cattle against raids (Harsema 1993: 106; Roymans 1999);
- enabling the collection of manure (Fokkens 1991, 1999; Gaillard, *et al.* 1994: 60; IJzereef 1981; Karlenby 1994: 31).

To these, it is common to add two others:

- having animals in the house helps to heat it;
- keeping animals indoors protects them from predators.

None of these arguments explain why it was necessary to bring the livestock into human living spaces, as these benefits could also have been achieved through other means or are simply unnecessary. For example, Zimmerman (1998) says that heat from animals does not reach beyond the byre part of the longhouse and has no effect on the human living section. On the contrary, the presence of animals creates a more humid and unhealthy indoor environment that leads the posts and planks to rot quicker.[5] The sturdy, small, quick domestic animals of the early bronze age would be superiorly equipped to fend for themselves both against the weather – particularly taking into account that the early bronze age was a very mild period – and against predators.

Several authors (Årlin 1999; Fokkens 1999; Rasmussen 1999; Roymans 1999; Zimmerman 1999) argue that other factors were crucial in choosing to share the house with animals. Rasmussen (1999: 287) suggests that a human-to-animal relationship developed in this period, and she advocates a point of view in which taking animals into the house was an expression of relations of affiliation with or ownership of the livestock. In southern Scandinavia, very few, small faunal assemblages have been recovered from house contexts in this period; interestingly, the evidence comes mainly from the architectural features of the longhouse. The visible internal divisions in the houses are important to manifest the human-to-animal relationship, as it suggests that animals were not perceived as humans. The physical separation of animals into a sphere apart from but still in the house nonetheless signals that the animals were perceived as a valuable part of the household, and in being taken into the house, they were given status as household members. In terms of the ownership of animals, this was defined by the building that housed them, and the building was defined by the humans living in it. Further, Årlin (1999) argues that by living inside houses, domestic animals were perceived as categorically pure, following Douglas' (1966) structural separation between purity and danger as a cultural construction. Implicitly, animal products, even dung, were perceived as pure, which gives animals the role of producers and, implicitly, as agents rather than as food and territory (Årlin 1999: 300).

Although this discourse refers to animals as a generic category, and sometimes to the slightly more specific but derogative term 'livestock', what is meant by 'animal' is frequently *cattle* (Barker 1999; Fokkens 1999; Rasmussen 1999; Roymans 1999; Zimmermann 1999). For example, when considering the development of the byre, both Zimmerman (1999: 133) and Waterbolk (1975) discuss the width of stalls and cattle size. *Cattle* is also clearly what Rasmussen

[5] Heiki Pärdi has expressed similar reservations on the basis of Estonian material in regard to the practical considerations of keeping animals in rehi houses (see Pärdi 1998: 109).

(1999) has in mind when she suggests that a management strategy of animals is tied to agricultural activities, not only dung collection. The agricultural strategy of the early and middle bronze age in southern Scandinavia seems to have been founded upon extensive cultivation, where new ground was constantly laid under the plough, requiring draught animals (e.g. Kristiansen 1993). The symbolic presentation of the relationship between humans and cattle on rock art always shows ploughing, but rarely pastoral activities such as herding (but see the Holst, Rasmussen (2013) argument in favour of extensive cattle herding). Therefore, economic and social aspects joined together in creating a new way of living for humans and cattle in the early and middle bronze age in southern Scandinavia (Rasmussen 1999: 288).

This suggests how pervasive livestock management had become in people's everyday lives. Husbandry was a very important task in the lives of early bronze age farmers (Grön 2004: 370; Rasmussen 1999: 286). Rasmussen (1999: 287) suggests that the symbolic representation of this "human-to-animal relationship" is reflected in graves where the dead are laid on or wrapped in cowhide, and in animal offerings at settlement sites. Thus, the relationship between the people and their animals created the longhouse as we know it (Armstrong Oma 2013b).

7. Shared spaces: the rehi house

A specialist in Estonian peasant architecture, Tamara Habicht, has expressed her conviction that the rehealune has been used for keeping animals indoors in winter as long as domesticated animals have been kept in Estonia (Habicht 1973: 56). This custom has persisted the longest in Western Estonia. Ildike Jaagosild, an Estonian ethnographer, has published a thorough overview on the threshing ground as a winter shed for animals (1967: 40–62), as well as an article on the reasons behind the habit of bringing animals occasionally to the rehetuba (Jaagosild 1965: 87–106). She admits that there is very little material that concerns animals' wintering conditions or the placement of animals in the rehealune. Field work and written notes originate from the middle of the 20th century. Some written documents indicating the usage of the threshing ground as a winter shed for domesticated animals date back to the end of the 18th century, in association with the advice that peasants should keep animals further away from their living rooms. The practice itself, however, must be ancient, as it is strongly associated with seasonality. In the summer time, animals were not kept in the rehi house, but remained in summer pastures (horse, sheep). Cows that had to be herded back home for milking every evening stayed at summer sheds that were light constructions at a little distance from the main rehi house. Jaagosild (1967: 44) indicates that there is a strong correlation between the occurrence of summer sheds and keeping animals in the rehi house.

Cattle and sheep had different pasture lands and were also kept separately indoors. The same is true concerning pigs (Jaagosild 1967: 43–44). Horses have been kept in the threshing grounds all over Estonia.

The rehi house often had so-called half-doors in the threshing ground walls. Only the upper half of such a half-door could be opened, in order to let in some light during the tending of the animals. The lower part of the door could be kept closed to keep the animals from going outside (Jaagosild 1967: 47).

For a long time, threshing grounds had no windows. When they started to emerge at the end of the 19th century, it was mostly in the name of improving the conditions for animals in the threshing grounds. No windows were needed for the room's threshing function. Improvements in this part of the house were in direct relation to its function as an animal shed, but they also brought along new problems. Stronger ceilings instead of the *tari*[6] constructions meant that the natural ventilation became poorer and that the logs in the walls began to rot more intensely, as they became covered with dung and room humidity increased (Jaagosild 1967: 55). This is similar to the assumed climatic conditions inside the animal part of the bronze age longhouses.

The average size of a traditional threshing ground was approximately 80–100 m^2. An average farm from the 19th century had 2 horses, 4–6 bovines (among them 3–4 milking cows and a pair of oxen), some sheep and pigs. The placement of animals followed practical considerations that made life easier for the farmers. Milking cows were placed close to the rehetuba to shorten the distance of carrying the milk after milking. Horses and oxen were placed next to the main gates so that it would be easy to take them outdoors when necessary. It was also practical in relation to fire hazards: the most valuable animals could be saved first. In winter, horses were used rather intensely, as major collective draught works took place in winter when straight routes across frozen sea ice, swamps, and rivers could be used.[7] Kaljo Põllu describes the trustworthiness of the native horses, especially during the long travels across the sea in winter conditions: "The islanders' horses had the especially admirable courage to jump over the cracks in the sea ice, even with loaded sleighs" (Põllu 2005: 231). In extreme weather conditions, humans often relied on the senses of animals, in this case horses, who were able to assess the environmental conditions much more aptly than the humans could themselves; humans were able to appreciate this. Preferably, horses were also placed underneath the opening in the ceiling through which dry hay was pushed down daily to feed the animals. Horses, then,

[6] According to Pärdi (1998: 291), separate summer sheds for seasonal use were constructed as light buildings of log poles at the corners and were bound together with light walls made of interwoven wooden sticks (*tari*). The same technique was used for constructing the ceilings of the rehealune, because it guarantees good ventilation and thus prevents the building from rotting.

[7] About winter roads, articles are available in Estonian, such as Mardiste 1971, Joandi 1990.

had the privilege of receiving the hay first. Cows were placed along the walls with their heads facing the walls, attached to their places by means of shackles that the animals wore around their necks and that were fastened directly to the log walls.

In many areas in Estonia, people divided the threshing ground into a front and back space. In the front space, located next to the rehetuba, horses moved around without any tethers. In the back space, cows were attached to the walls. This arrangement embraced both practical and sanitary considerations: horse dung is dry, and its smell is not sharp. It was convenient to feed the animals next door in the morning before humans and horses went to work together. Bringing water to horses was also easier as they could drink from the threshing ground while bending over the half door. Only the young colts were tethered in temporary stalls in the case of such an arrangement.

Keeping animals in threshing grounds had several practical reasons: it enabled people to save valuable construction material and was a convenient arrangement for tending animals during winters, with only a short distance to the animals and no need to go outdoors into the deep snow. Jaagosild (1967: 40) claims that connecting the human and animal living spaces under the same roof has historically been a widespread practice throughout the northern European forest areas. It is an economic and convenient solution. This is certainly true for Scandinavia until the late Iron Age, around 600–1000 ACE (depending on the exact region).

In some cases, keeping animals in threshing grounds was a necessity, not the primary choice of the peasants. Habicht (1967: 63–100) remarked that regarding the Estonian settlers in the Pskov region in 1860s, the rehi house was always erected first. Animals were kept in this house until separate sheds were constructed. The latter were also shared spaces, combining the cattle shed and chaff loft or the horse stall and pigsty. When the weather was not too cold, animals lived on the threshing grounds, but during bitterly cold times, they could also be taken to the rehetuba (the human living quarters). In both cases, cribs were attached to the walls for the animal fodder, and troughs were placed on the clay floor. When the weather became milder, animals were moved again from the rehetuba to the rehealune, until the vegetation season began and they could be led to pasture outdoors. Jaagosild writes that the most common human companions admitted to the rehetuba were hens and a rooster. They would live in a hen coop, stationary or improvised (under the plank bed), or perch by the big rehi stove. Newborn animals, such as lambs and piglets, could be taken to the rehetuba for their first days of life so that they could gain strength in a relatively warm and safe place, under the attention and nursing of the human peasant family.[8] Animals that were about to deliver could also be taken to the rehetuba so that it would be easier to keep an eye on them and their offspring. Such episodes did not usually

[8] Such an arrangement of things reinforced the bonds between humans and animals from the start; in some cases, it most probably even resulted in imprinting.

last more than a couple of days, after which the animals were returned to the threshing ground – hens being an exception. When the weather was harsh and the horses needed to be out for draughts on winter roads, even shoeing took place in the rehetuba (Jaagosild 1965: 89–91).

In the following, some remarks about the placement of individual animal species in the threshing room are provided.

Habitually, **horses** had to be kept close to humans (especially to men who were their main caretakers). This served several purposes. Horses were the most valuable domestic animals, and they had to be protected from theft. As horses worked in close co-operation with humans, they had to be in constant contact with their co-operation partners in order to maintain a trustworthy relationship. Horses served as assistant animals[9] to humans in many regards. Living literally side by side has probably facilitated the establishment of mutual bonds of trust and understanding between humans and horses. Unlike cows, horses were always kept in the rehi building, in the same house where humans lived. Separate stall buildings for horses were first erected only at the end of the 19th century, in association with the buying of farms by the former tenants (Jaagosild 1967: 225). The rehi was the most common space for horses until the 1960s (Pärdi 1998: 109).

Horses seem to have a somewhat special status, as they could be placed in separate stalls against the wall of the rehealune. Peterson claims that the horse stalls were of a temporary nature. Permanent stalls could not have been built in the rehealune because the additional constructions would have hindered threshing (Peterson 1967: 21–25).

The threshing room was also the space where all draught equipment – carts, sleighs, wagons, etc. – was stored. Thus, we can regard keeping horses in the same room also from the point of view of technology: as animals and draught equipment formed functionally an inseparable unit, it made a lot of sense to keep them in one and the same space. The Estonian vernacular metaphor for horse, "oat engine", also reveals the understanding of the animal as a part of a bigger technological entity.

On the other hand, there is evidence for humans abusing such mutually trusting relationships, too. Historian Ken Ird has studied the court cases dealing with sodomy in the Early Modern times in Livonia (Ird 2013). One peculiar result is that most often, the accused men have engaged in forbidden relationships with their horses. Whereas tending cattle and taking care of the sheep were traditionally women's tasks, men were typically the ones working with and taking care of horses; one result was that men used to spend considerable amounts of time together with their horses, but had probably less contact with other domestic animals. Such bestiality between men and horses could have a long history, and knowledge of such practices (real or imagined) is also attested in Swedish bronze age rock art (e.g. the rock carvings inside the grave mound at

[9] About the concept of assistant animals, see Magnus 2015.

Sagaholm, see Goldhahn 1999). However, in bronze age discourse, such images are seen as examples of how animals were perceived as enormously powerful; the myths portray them as partaking in the creation of the universe (Kristiansen, Larsson 2005: 320; Kaul 1998: 53; Fredell 2004: 437). Therefore, it was important to have access to the power of animals: "[g]ods take animal shape to achieve their special powers and abilities, or animals take over part of the human soul. Animals in nature are spirited" (Kristiansen, Larsson 2005: 320). This way of thinking might be the foundation of the sexual human-horse relationship thought to be related to the initiation of the new king, and can be found in different sources, depicted on Scandinavian rock art and also accounted for in Hittite laws and Irish sagas (Kristiansen, Larsson 2005: 324–328).

Cows, as has been indicated above, were kept in the threshing room either as fixed along the walls or at the far end of the room. Cows were attached to the walls of the sheds or to the walls of the rehi by means of shackles. Small holes were drilled through the wall. Shackles were attached to these holes and secured from the other side of the wall with a wooden stick, often made of oak (Pärdi 1998: 85). Fodder for cows was placed directly on the ground. When cribs started to be used in the rehealune, cows could be attached directly to the cribs. This probably required the animals to be relatively tame because such an attachment is weaker than when fastening animals directly to the walls by means of a tether. Cows having calves could be separated from the rest of the cattle.

Finnish researcher Taija Kaarlenkaski has studied the human/cow relationship on the basis of a Finnish collection of life histories about cattle-keeping (Kaarlenkaski 2014: 191–216). She argues that in the case of small-scale farming, it is very important to have a trusting relationship with the cows. Cows are regarded as colleagues and family members in these stories, and many of their authors claim, based on their personal experiences, that women are better at building empathetic relationships with cows than men are.

Sheep often had a separate shed attached to the outer wall of the rehi house. Ränk (1939: 305) writes about the custom of keeping sheep in the anteroom of the sauna and mentions that this arrangement has been preserved mostly on the islands, especially in eastern Saaremaa and the Muhu islands. During sauna evenings, the sheep were either driven out from the sauna or penned in one corner of the anteroom by means of a hurdle.

Jaagosild (1967: 44) writes that **pigs** were kept outside of the threshing room in a separate shed erected against the outer wall. The practical reasons for this are that the pig dung is liquid in its consistency and that it smells worse than the dung of many other domestic animals. Pigs also produce a lot of dung. If the pigsty was small, pigs could be taken indoors to the threshing ground at the end of the winter when the shed was too full of dung already. Being located "beyond the city walls" also made pigs more suspect to predators like wolves. Evidently pigs were not considered as valuable animals as horses, oxen or cows, given that

the precautionary measures for protecting them from being lost were not as strong as those exercised with other domestic animals.

The few **hens** and cocks that were kept for the whole winter were usually kept in the same room as humans, since they are small birds and very sensitive to cold. In some cases, hens could also live in the threshing room.

It is curious to find that in Estonian ethnographic material, there is no mention of **cats and dogs** among domestic animals. Dogs were helping to herd the bigger animals, and they also repelled wild animals, such as wolves, from around the farms. Dogs roamed around freely and had a special place in the life-world of the rehi dwellers. Unfortunately, this relationship has not been studied much and must therefore remain outside of the framework of the present article.

As a parallel to the Estonian material from Great Britain, MacGregor (2012: 418) provides an observation from the 17th century, stating that "farmers and poor people [made] very little difference between themselves and their beasts" because they had to work daily, side by side. Treating animals bad would do harm to both the animals and to the humans whose daily lives depended on them.

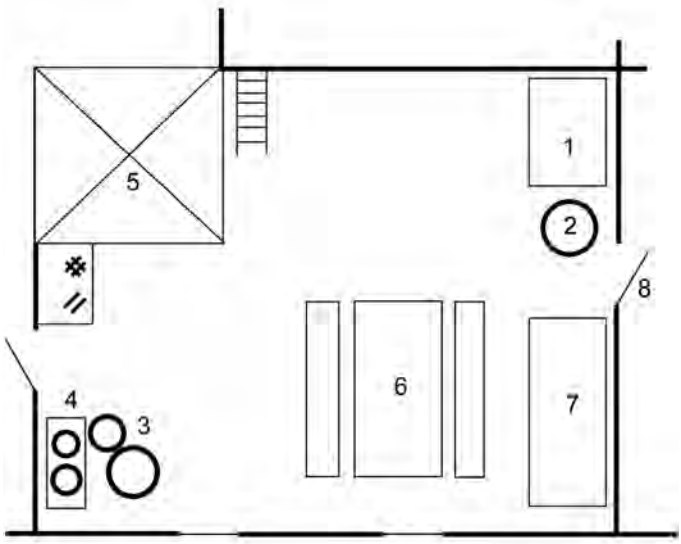

Figure 5. Animal positioning in the rehetuba from western Estonia. The door on the left leads to the anteroom. The hen coop (1) and the drinking vessel for horses (2) are located next to the door that leads to the threshing ground (rehealune; 8). The hen coop could be sat or even slept on. The trough for pig food (3) is close to the drinking water buckets (4) and to the hearth where the food was prepared. Also indicated are the stove (5), the table (6), and a plank bed (7). Re-drawn from Jaagosild 1965: 93; based on the correspondents' archives in the Estonian National Museum.

Poor conditions in the rehi and harsh winters[10] sometimes resulted in humans and animals literally sharing the same living space, as animals were temporarily transferred to the rehetuba – it was simply warmer together, and it was convenient to keep an eye on the sick animals. For hens and roosters who were kept with humans throughout the winter, special hen coops were established to keep the birds both warm and confined (Troska, Viires 1998: 278). Temporary latrines were made for young animals, too, so that they would not intertwine with the household activities of the humans. In Saaremaa and in western Estonia, cattle about to give birth were occasionally brought to the rehetuba (Pärdi 1998: 109). In case the delivery was problematic, even the sheep preparing to give birth could be brought into the living room until the critical event was over. The same is true regarding weak and sick animals: people preferred to take care of them in the warm rehetuba where it was also easier to keep an eye on them and to monitor their health situations (Troska, Viires 1998: 279). Gustav Ränk, the most prominent researcher on the functional aspects of Estonian peasant culture, has written in his concise overview of peasant houses in Saaremaa that

> In addition to humans, the rehetuba has sometimes also served as a space for domestic animals, but this habit has left no traces in the construction of the room. The hurdles and ladders that were used to fix small animals to some corner of the room – preferably behind the big stove – were a temporary feature in the room, as were the animals themselves. The beam that was attached to the wall for the hens and the rooster to roost upon, was removed as soon as the weather was warm enough to have the birds outside of the living room. During great winter colds, horses have sometimes been shoed in the rehetuba. This is testified to by the iron rings attached to the side-post of the door between the living room and the threshing room in the rehi. (Ränk 1939: 184–185).[11]

This indicates that domesticated animals were regarded as family members just as much as a resource on a traditional peasant farm. Especially those animals who were weak for some reason were admitted to human living quarters for the sake of better care. Their survival and well-being was an incorporated part of the habitus of the whole household.

A poem in the Muhu dialect, written by Meeli Kokk in 2009, sums up the topic as follows:

[10] Heiki Pärdi (1998: 109) argues that the threshing floor is actually not suitable for keeping animals in winter: it is too big and too cold a space. In order to keep the warmth emerging from animals inside the room, the doors were insulated with straw, fir branches, etc.

[11] Translation from Estonian by K.T.

Nüüd oo müödas kõik nie aad,	Now these times are gone
luomi põle elus-moas.	No animals around.
Kümneid voastud tagasi	It was tens of years ago
köis sie elu sedapsi –	When it was a common lifestyle
et kut talve põrsas tuodi	When a piglet was in the house in winter
taale tuppa tehti vuodi.	A bed for it was made in the living room.
Ja viel oma silmaga	And I have seen it
ole seda koa näin ma,	with my own eyes –
et laps makab oetel tallega.	a child and sheep sleeping in the same bed.[12]

Conclusion

There is both archaeological evidence from Norway and ethnographic evidence from Estonia to the effect that domesticated animals and humans have shared their shelter, living under the same roof and occasionally even in the same room. By juxtaposing the data and comparing the comments of earlier researchers, we can say that the historical human–animal cohabitation is a topic that has not yet received a completely exhaustive analysis. Our contribution to the discussion stems from the semiotic understanding that life as such is communication-based. In order to be able to live closely together, a special habitus emerged, and even the umwelten of the engaged species grew more adjusted to each other. The areas where humans and animals worked and lived together, both indoors and outdoors, could be conceptualised as special eco-fields that met the needs of different species.

Animals most probably lived in human houses on a seasonal basis, mostly during the cold Nordic winters when it was not possible to herd the animals onto pasture lands and when the predation pressure was highest. Animals were located in human houses according to a certain order, taking into account their value, their movement and tending needs, and their health condition (such as delivery). In either case, the building structure of Norwegian longhouses and Estonian rehi houses does not give strong indications in their very construction of the animal placement. But as the Estonian example shows, such practices would not necessarily leave material traces. One possible reason for this is that the animals stayed indoors only seasonally, and the constructions that were built to meet their needs and the needs of the humans were rather ephemeral. Animals were fastened to their places by means of light wooden constructions that did not leave any permanent traces in the buildings or in the archaeological record.

The fact that humans and domesticated animals have shared their overlapping life-worlds indicates that animals occupied an important position in the humans' daily lives, in their well-being and in their umwelt in general. Perhaps our modern

[12] Translation from Estonian by K.T.

human umwelt is much poorer because of the absence of other species next to our own?

Our brief comparison of this study material indicates that, in the past, animals were considered to be important counterparts in human life, and that animals and humans alike could be household members that each served cultural, social and economic ends for the good of all. Further, trust is important to the human/animal relationship and is brought on by the proximity and ensuing intimacy of the shared life-space. Humans trust animals to be docile and cooperative, whereas animals trust humans to protect them, feed them and care for them. Mary Midgley highlights the social spark necessary to create such relationships: "All creatures which have been successfully domesticated [...] were originally social. They have transferred to human beings the trust and docility which, in the wild state, they would have developed towards their parents, and, in adulthood, towards the leaders of their pack or herd" (Midgley 1983: 112). Fundamental trust forms the basis for animals to give up some of their autonomy and for humans to claim responsibility (Armstrong Oma 2007: 64, 2010).

In order to more fully understand the nature of such co-habitual relationships, the application of an umwelt-centred semiotic approach in the interpretation of archaeological and ethnographical data may provide further insights into this very interesting question.

Acknowledgements

The research for this chapter was supported by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Semiotics and the species management discourse: the temporal dynamics of the emergence of new species

Timo Maran

1. Introduction

The present era of anthropogenic environmental change creates conditions for many species to spread beyond their initial living ranges – a process that may have further effects on local ecosystems, human societies and cultures. The purpose of this chapter is to map the semiotic and temporal dynamics of these processes by focusing on the semiotic activity and dynamics of the new species and different interest groups in human societies. A specific feature of human discourse on new or invasive species appears to be its dynamic nature, with new species adapting to the local ecosystem, thereby changing knowledge of the interested human parties, with no participant having full information of the process. In order to study such dynamical interactions between culture and nature, the present chapter synthesises understandings of the semiotics of cultural change (Lotman 2009), of the semiotics of environmental communication (Low 2008), of the social studies of species management, and of Actor-Network Theory (Callon 1986; Law 2008; Latour 1997), as well as of the semiotics of animal modelling (Uexküll 1982; Sebeok 1990, 1991) and culture-nature relations (Kull 1998).

From the biosemiotic/zoosemiotic perspective, it is important to take into consideration the semiotic activity and subjectivity of the individuals of the new species itself when describing their relations with other biological agents, with human interest groups, and with underlying human cultural factors (e.g. the general cultural models and distinctions used to make sense of animals). The general methodological principles of a semiotic approach to species management could be mapped as follows:

1. Natural processes, nonhuman animals and human social groups are all considered to be agents that are able to initiate change and which can be influenced by changes initiated by other parties.
2. All living parties (species, different social groups) are considered to be semiotic subjects. Semiotic subjects seek to understand their environment. In order to do this, semiotic subjects use their abilities of modelling (that is, making sense

of surrounding environments, processes and actors on the basis of analogical relations) and self-modelling (Lotman 1967: 130–131; Sebeok 1991).

3. The process of species conservation is seen as an ongoing negotiation of self-modelling and modelling processes between different human parties and biological species. In this process, various means of communication are used. These methodological principles emphasise both the activity of semiotic subjects as well as communicative interactions and regulation between different parties (cf. Maran 2015).

As a practical research object to exemplify the proposed theoretical approach and methodology, this chapter is based on the case study of the emergence of the golden jackal (*Canis aureus*) in Estonia, its cultural interpretations and the dynamics of the developing discourse. As far as we know, the golden jackal is not a native species in the Baltic region. The closest stable populations of the golden jackal to Estonia are in Hungary and in the Balkans. In recent years, jackals have also been found in Austria and Slovakia, and the geographical range of the species appears to be moving northward (Arnold *et al.* 2012). The first specimen of the golden jackal in Estonia was hunted down at the end of February 2013 in the Hanila parish, western Estonia. Anecdotal evidence about encounters with the new species followed from other regions. In this context, the new species, its trajectory of arrival and its possible influence on the local environment became a topic of vivid discussion among zoology specialists, environmental officials, the local people of the Hanila parish, and the general population.

In order to study the opinions about golden jackals and to detect underlying cultural motifs, nine semi-structured interviews were conducted in the autumn of 2013 with local inhabitants of the Hanila region and of western Estonia, as well as with people with some professional involvement (professional zoologists, officials at the Ministry of Environment and state environmental agencies). The interviews were arranged around the following topics: participants in and the nature of the discourse on the golden jackal, the position of the golden jackal with regard to Estonian nature, the concept of non-native species, cultural and ethical issues related to the golden jackal, and personal familiarity with the golden jackal. The interviews lasted from thirty minutes to one hour and fifteen minutes, and were later fully transcribed and coded by keywords. In addition, biological research articles on the golden jackal, popular articles in public media, and internet commentaries were used as sources of supporting information. In discussion among specialists as well as in public discourse in newspapers, considerable attention was paid to the issue of how the golden jackals arrived in Estonia: whether by natural migration or by being brought in by humans and released into the wild. The latter option would justify seeing these as alien or invasive species. In May 2013, the Estonian Ministry of Environment took the position that the golden jackal in Estonia is a non-native species. This was followed in September 2013 by a statement from the Environmental Board

(*Keskkonnaamet*, a state office for environmental issues) granting to local hunters' organisations the right to shoot golden jackals for regulating the species. That decision gained mixed responses from different interest groups.

The case study of the golden jackal in Estonia provided knowledge about different aspects of environmental communication and culture-nature relations in regard to novel species. The results on the semiotic activity of the golden jackals, as well as their cultural modelling, were published in Maran 2015. Based on the same case study, in this chapter I analyse the temporal dynamics and different stages of the discourse on this new species.

2. Temporal dynamics of the novel species discourse

2.1. Theoretical framework

The emergence of golden jackals in Estonia has been definitely not a static situation. Both the ecological situation and the discourse surrounding golden jackals has changed quickly without many fixed points of reference. The living range of golden jackals was in flux, as they supposedly spread from the Hanila parish to other areas in Estonia. Scientific understanding of golden jackals has not been reliable, as there was a lack of data about the behaviour and ecology of golden jackals in the Nordic climate. Their relations to other species (prey, competitors, predators) has gradually become better known. The discourse surrounding the golden jackals appeared to be in development, with a lot of information about jackals existing in the form of rumours, anecdotal evidence, and personal opinions.

For analysing such dynamical processes, approaches in semiotics and cultural theory can be useful. From a cultural semiotic viewpoint, Juri Lotman (2009) has described the interchanging eras of culture in terms of normal development, and explosion. In the explosive stage, the transformations of culture are unpredictable, and the self-description of the culture is hindered. The description and evaluation of the unpredictable rupture is constructed post-factum, after the explosive stage, when the cultural communication becomes normalised again: "The moment in which the explosion is exhausted represents the turning point of the process. In the sphere of history this is not only the originating moment of future development but also the place of self-knowledge: the inclusion of those mechanisms of history which must themselves explain what has occurred" (Lotman 2009: 15). In the context of the present topic, it is relevant to perceive that different forms of environmental change can also act as explosive situations that disturb the development of cultural discourse. Environmental change is an externally induced alteration of culture, and its full meaning and effect often becomes clear only retrospectively. Another useful tool to describe the dynamical processes between culture and environment is Kalevi Kull's (1998) ecosemiotic

typology of different natures in the semiosphere. This typology distinguishes between four dynamical stages of nature mediated by human cultures as follows: 0-nature is nature as it is in itself, 1-nature is nature as perceived and verbalised by culture, 2-nature is nature altered on the basis of cultural perceptions and 3-nature is nature represented as a part of culture. For the following discussion, it is relevant to note that there exist dynamics between different forms of nature in human culture – that is, one type can change into another. With some adjustments, Kull's typology can also be used to describe relations between an animal species and human culture (cf. Maran 2008, 2014).

The temporal dimension of human environmental conflicts has been also theorised by the French sociologist and Actor-Network Theory scholar Michel Callon (1986), who distinguishes between four subsequent stages of human involvement in the environmental conflicts. With some simplification, these stages can be called

1. the problematisation, where the original problem is perceived and verbalised;
2. 'interessement', or activities by which identities will be attached to the participants and the meaning of the situation will be fixed;
3. enrolment, or the problematics and strategies of how to make participants stay in their particular roles;
4. mobilisation of allies, or the question of how to find and choose representatives of different parties and engage them in the process.

Callon interprets environmental conflicts in terms of the pursuit of the social group to establish, propagate and protect its interpretation of the situation.

From the biosemiotic/zoosemiotic viewpoint, we should emphasise the role of the biological agent. The four stages of the temporal dynamic of environmental conflict could be described as follows: 1) an expression of the activity of the biological agent, 2) a counteraction by the cultural-social discourse in an attempt to control the situation, 3) a perceivable discrepancy between the self-organisation of the biological agent and the meaning attribution by the cultural discourse, and 4) an emerging new layer of interactions between biological and cultural agencies, normalising the cultural discourse. The major difference from Callon's typology is that while he emphasises the position and activity of the human agent, for the present biosemiotic approach the semiotic effects of biological agents in the environment are also taken into account. Such a view is supported by David Low's (2008) analysis of semiotic environmental communication, in which he makes a distinction between a knowledge approach and an enquiry approach to environmental communication, the latter of which is concerned with seeking out the truth about the communicative processes in the environment itself. In both approaches, Low emphasises the role of dissent (disagreeing perceptions or activities) by ecological and cultural agents as an essential property of environmental communication. Drawing from Peircean semiotics, for him human assertions about environmental processes (interpretant) are always approximations of what is happening on the actual object level, and the essential

cause of the dissent is the difference between the dynamic and the immediate object (Low 2008: 56).[1]

In the following subchapter, I will discuss how the four stages of environmental conflict were perceptible in the emergence of the golden jackal in Estonia. As part of human cultural activity (corresponding to the second stage of the typology mentioned above), some authors have also used the concept of "enactment" as a "performative aspect of knowledge – how, that is, objects are "done" or "enacted" in different ways by different interested parties" (Knudsen 2014: 62). To trace the dynamical relations between the biological agency of golden jackals and human agency, I make a methodological simplification and limit the following discussion of human agency to the state policy makers and environmental officials. In the case-study, the interrelations between zoologists, environmental officials and local inhabitants formed a complex web of interactions. For example, the co-operation between field biologists and their endeavours in determining the new species formed a dynamic discourse of its own. These interrelations between different human interest groups (environmental officials, local farmers, professional zoologists, hunters, etc.) that may have different complex conflict dynamics (e.g. Gerner *et al.* 2011) are thus not included in the present analysis.

2.2. Application in the case study of the emergence of the golden jackal in Estonia

To include the jackals' agency, we need to adopt a biosemiotic/zoosemiotic perspective that treats semiotic utterances of humans and other species on the same grounds (following e.g. zoosemiotics, Sebeok 1990). It may be claimed that the golden jackals' semiotic activity itself had a considerable influence on the initiation and development of the discourse. The first rumours of the unknown species were based on local farmers of the Hanila region hearing the golden jackal's howling. In physical encounters, the golden jackals had a certain character and behaviour which appealed to local people. Such experiences were reported by the local people of Hanila as important aspects in their interactions with the golden jackals. As told by a local informant (M, 1955), "[the Jackal] is very sensitive, very lively. The fox is clever, they say, but the fox is stupid in my mind. But this is something else... [the jackal] is beautiful, slender, alert [...] still lovely and interesting or so. And sometimes we look each other in the eye".[2] The golden jackal's visual appearance, with its long legs, slim body and seemingly effortless

[1] This distinction is based on the semiotics of Charles S. Peirce. According to him, objects can be further divided into two aspects: the "immediate object", which is the object as it is revealed within the sign itself, and the "dynamical object", which is the object that exists outside the sign. The dynamical object we know by "collateral", that is, through indirect knowledge (CP 8: 314).

[2] All interview excerpts are translated from Estonian by the author. Respondents are referred to anonymously as (gender [M/F], year of birth).

movement in photographs and videos, has probably also had an influence on the general public discourse.

With regard to the four semiotic stages of the conflictual process of new species, the first stage – an expression of the activity of the biological agent – would cover the events from the emergence of the golden jackals in Estonia to the official recognition of the species as a part of biological taxonomy: *golden jackal*. Early imaginations of the golden jackal included naming it as a "strange creature" (*imeloom* in Estonian) and as the "howling fox", based on the analogical relation to the red fox. The information that was available about the unknown species in this stage was episodic, ambivalent and largely anecdotal. People's opinions varied to a great extent. The official recognition of golden jackals took time, and the local people who had had personal experiences with the animal were somewhat stressed that their observations were not taken seriously.

The second stage – counter-action by cultural discourse in an attempt to control the situation – started with the confirmation of the new species by environmental officials and by their labelling it as a non-native species. Interpreting the golden jackal as a non-native species was in fact one among several existing interpretations. Interviewees also perceived golden jackals as representing an increase in biodiversity, or as a tourist attraction; they were also curious due to their naturalist or research interests, and expressed emphatic attitudes derived from the cultural image of the settlers' narrative (cf. Maran 2015). The decision to interpret the golden jackal as a non-native species was made promptly by environmental officials in order to avoid the possible negative effects of golden jackals on the local nature, as well as to prevent jackals from spreading. On the cultural-discursive level, the environmental officials refused to interpret golden jackals as having any subjectivity. The hunting process was officially described in neutral terms as the "removal of the non-native species from Estonian nature",[3] with officials saying that "the Estonian Hunters' Society asked what we are going to do about this non-native species and we answered that, yes, we consider it to be a non-native species" (F, 1983). A neutralising and in some cases even a demonising approach (see figure 1) prevented jackals from entering the public discourse as subjects but, at the same time, laid the basis for the future discursive conflict between the golden jackals and policy makers. Applying Michael Callon's concept of 'interessement' to the second stage, an attempt was made to fix the meaning of golden jackals as not being part of Estonian nature and cultural discourse.

[3] Amet: šaakalid tuleb eemaldada, Eesti Päevaleht, 21. May 2013.


Sel sügisel hakatakse šaakalitele jahti pidama (31)

12. september 2013 04:00

Ulvar Käärt

Kuidas täpsemalt šaakalite arvukust reguleeritakse, peaks selguma lähinädalatel.

Kui seni oli kindlalt teada, et selle aasta märtsis esimest korda Hanila vallast avastatud šaakalid on kanda kinnitanud ainult Lääne-Eestis, siis tänaseks on kinnitust leidnud, et liigi esindajad on jõudnud ka Virumaale.

Nimelt lasti augusti alguses Kiviõli jahipiirkonnas otse lagedate põldude vahel maha üks kummaline

Šaakal on Eestis ohtlik võõrliik.

Foto: AFP / Scanpix

Figure 1. Golden jackal labelled as a "dangerous non-native species" in an article in the Estonian daily newspaper *Eesti Päevaleht*, 12.09.2013.

We could also perceive that in order to stage golden jackals as a non-native species, several conceptual and factual problems needed to be overcome, and fixing the meaning of non-nativeness for the golden jackal required intentional effort. This was so from the very beginning, as the concept of a non-native species is itself formally difficult to define. For example, it is not easy to determine the scope of human activities (do indirect activities, such as human-induced environmental change, count?) and what are the spatial and temporal limits of "local nature" (are these the state borders of Estonia, or rather a wider geographical region? For discussion concerning the ambivalence of the "non-native species" concept, see Warren, 2007). Second, the position of the golden jackal was especially problematic in relation to the native/non-native divide, since scientific evidence was missing about whether humans have transported and released specimens of golden jackals into Estonian nature or whether they were spreading on their own. Thus, the concept of "non-native species" appeared to be used as an "operational concept" according to the custom and need. This understanding was also supported by the opinions of people interviewed: "this entire concept of non-native species is really difficult to settle" (M, 1959); "it is such a purely anthropocentric concept that ... and well, those borders are so fuzzy" (F, 1972) (cf. Maran 2015).

In interpreting the cultural perception of the golden jackal, it should be taken into account that the cultural perceptions themselves were framed by a broader change of environmental conditions. That is, they could be interpreted in the framework of a shifting balance between the global environmental change and cultural auto-communication and a drive towards stability. As expressed by respondents, "If indirectly climate warming is the reason for why certain species are moving up north, then what are we going to do? Shall we start building a Chinese wall on the Estonian border to prevent species from entering? What's the point?" (M, 1959); "As there is this climate warming and soon turtles will also be here, then this is inevitable, we cannot do much about this. We can be rude and it can be good for a while or it can also be catastrophically bad" (M, 1955).

In the sequence of the semiotic stages of environmental conflict as presented above, the third stage was characterised by an increasing discrepancy and conflict between the self-organisation of the biological system/agency and the meanings attributed by the cultural discourse. At the time this chapter was written (March 2015), the third stage of the process was still in development, but we can already witness how the activities of the golden jackal, as well as different social factors, do not support the dominant cultural discourse of the golden jackal as a non-native species. There have been new findings of golden jackals in various regions of Estonia: western (Hanila, Taritu), southwestern (Häädemeeste) and the eastern (Kiviõli) region (altogether 9 confirmed specimens shot or found dead), as well as in Latvia (8 individuals). This suggests that the jackals have spread more widely than expected by environmental officials and that their quick removal as a non-native species is becoming problematic. The several findings of jackals in the Baltic region also question the hypothesis of human agency (that is, the deliberate introduction by transportation/translocation) as the cause of the emergence of the golden jackals. The hunting measures have not turned out to be very successful, and at least in some cases, local inhabitants empathetic toward golden jackals have ceased giving information about the whereabouts of golden jackals to officials. The self-organisation of the biological agency (the jackal as well as other ecologically related species) creates conditions for dialogue and "negotiation" that may lead to a more interactional and balanced cultural discourse.

At the present moment, the fourth stage of the process is still a matter of speculation. I would expect some normalisation of the interactions between the golden jackals and human agents to occur, which would lead to an acceptance of golden jackals as members of Estonian fauna, accompanied by the use of normal measures of wildlife surveillance and species regulation. It can also be expected that in the fourth stage, the topic of golden jackals will lose its exceptionality and special meaning, and golden jackals will be treated as one among other non-native mammalian species in Estonia (e.g. the raccoon dog [*Nyctereutes procyonoides*], the American mink [*Neovison vison*], and the muskrat [*Ondatra zibethicus*]). In

the case of carnivorous species, this would probably mean establishing a shifting balance between species abundance and predatory activity on one hand and human regulative hunting measures on the other. This would produce a hectic and emotional yet relatively stable discourse.

In applying the temporal model proposed above to the case study of the emergence of the golden jackal into Estonia, it is also relevant to recognise that the temporal stages of environmental conflict are probably not exclusive to one another but instead overlap partially. In a temporal sequence, we can depict this as a series of subsequent waves. The discourse is triggered by an activity of the biological agent. Thereafter the counter-activity by the human cultural-social agent commences, different interpretations emerge and the dominant discourse makes an attempt to overcome and suppress the activity of the biological agent. If human actions are effective, the biological agent may be excluded from the environment and from the discourse. If they turn out to be ineffective, the activity of the biological agent will be expressed in ways that do not fit in the existing cultural-social discourse and will endanger its stability. In the third wave, some sort of balance will be found between the activities of the human and biological agent, and the discursive system will incorporate both of them.

3. Further perspectives

Four temporal stages of environmental conflict in non-native species discourse were distinguished above: 1) expression of the activity of the biological agent; 2) counter-action by the cultural-social discourse in an attempt to control events; 3) perceivable discrepancy between the self-organisation of the biological agent and the meaning attributed by cultural discourse; 4) emergence of a new type of semiotic interaction between the biological and cultural agents. Although this typology has not been tested in other cases besides the emergence of the golden jackal in Estonia, it can be expected to map the general dynamics of environmental conflicts. In this subchapter, I will discuss some further theoretical and practical possibilities of this typology with regard to other sources in biosemiotics.

We can notice a remarkable parallel between the temporal typology of the environmental conflict and Kull's (1998) typology of different natures in the semiosphere (figure 2). Both typologies consist of four entities, and it is possible to map one-to-one correspondences between these. Expression of the activity of the biological agent corresponds to the interaction between Kull's 0 and 1 nature (that is, nature from nature interacting with culture from nature); counter-action by the cultural-social discourse in an attempt to control would correspond to the interaction between Kull's 1 and 2 nature (that is, culture from nature interacting with nature from culture) and so on (Table 1). The interactional nature of Kull's typology as juxtaposed with the typology of temporal dynamics comes from

the fact that the original typology by Callon describes different aspects of the conflict, whereas Kull's typology describes mediation stages of nature in human culture. Kull's approach can be seen as a general typology of culture-nature relations, whereas the temporal typology of the environmental conflict is suitable for special dynamical cases where biological agency plays an important part in the process.

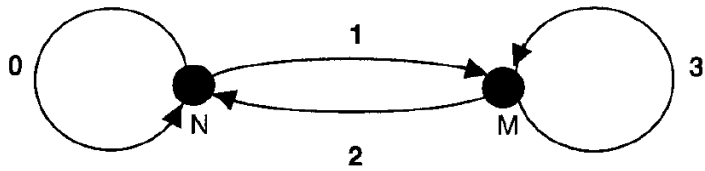

Figure 2. The processes which generate the 0th, 1st, 2nd, and 3rd nature. N – nature, M – image (Kull 1998: 357, published with permission).

Table 1. Possible correspondences between the typology of the temporality of environmental conflict and Kull's typology of different natures in the semiosphere.

Stages of environmental conflict	*Kull's (1998) typology of different natures in the semiosphere*
Expression of the activity of the biological agent	Interaction between 0 and 1 nature
Counter-action by cultural-social discourse and an attempt to control events	Interaction between 1 and 2 nature
Perceivable discrepancy between the self-organising force of the biological agent and meaning attribution by cultural discourse	Interaction between 2 and 0 nature
Emergence of a new type of semiotic interaction between the biological and cultural agencies.	Interaction between 3 and 0 nature

Juxtaposing the typology of environmental conflict and Kull's typology of different natures in the semiosphere could help us understand the discrepancies of human activities in the situation of environmental change. For instance, it was proposed that the counter-action by the cultural-social discourse corresponds to the interaction between Kull's 1st and 2nd nature (culture from nature interacting with nature from culture). If this is correct, then in Kull's conceptual framework the counter-action by the cultural-social discourse would be connected with the

incompatibility of human perception and action towards nature. The environmental relationship (especially with regard to some natural agency) would include the conflict between the parts of culture that are aligned with the perception of the environment (*Merkwelt*, Uexküll 1982) and those that are more aligned with action toward the environment (*Wirkwelt*). In the case of the emergence of the golden jackals in Estonia, differences were indeed observable in the attitudes between the local inhabitants and environmental officials (e.g. with regard to the positioning of agency to human culture/environment, in the belief of the effectiveness of hunting measures, see Maran 2015). Thus it seems reasonable to propose that the temporal dynamics between the new species and human cultural discourse also brings along certain dynamics within the culture itself: namely, a discrepancy between environmental perception (human *Merkwelt*) and action/regulation (human *Wirkwelt*). Furthermore, differences in the ways that humans arrange and attach to nature in the semiosphere are accentuated.

Conclusions

Based on the case study of the golden jackal in Estonia, the emergence of the novel species appears to cause an environmental conflict with specific temporal dynamics. In such a conflict, the activities of the animal as a semiotic subject and as an agent have an important effect on the development of the discourse. The emergence of the new species may create instabilities in culture and in culture-nature relations. The cultural discourse appears to go through different stages of development, with a potential for conflict rising from the dynamical structure of the process itself (as discrepancies between the biological agent and the human agent as well as between perception and action in the environment). For culture, the emergence of the new species creates an unpredictable situation (*sensu* Lotman's explosion) that makes it difficult to describe and also to analyse the events. Instead, in the process of the emerging new species, the discourse is overflown with ambivalent and partly contradictory information, and a reliable understanding emerges retrospectively (cf. Callon *et al*. 2011). In such processes, a successful management practice as well as an analysis would depend on a broad framing of the communicative process that acknowledges the agency of both humans and of non-humans and the role of dissent in environmental communication. In such a situation, including different interest groups (field biologists, local inhabitants, etc.) in the decision-making process and making use of integrative communication practices could be suggested as a way to a more reliable and long-lasting environmental communication practice.

Acknowledgements

The research for this chapter was supported by the European Union through the European Regional Development Fund (Centre of Excellence for Cultural Theory), under institutional research grant IUT02-44 from the Estonian Research Council and under project contract EMP151 by the Norway Financial Mechanism 2009–2014.

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The semiotics of predation and the umwelten of large predators

Morten Tønnessen

1. Introduction

Carnivores are emblematic of the brutality of nature in that, apparently, in order to live, they have to take lives – as, at the very least, most animals do.[1] This is not strictly speaking the case, since various scavengers and vultures feed on dead animals without necessarily killing them. Even herbivores – animals that eat plants and perhaps fungi – might to some extent be taking lives, even though herbivores often feed on plants, or rather plant parts, without necessarily killing the plant organism.[2] But predators kill.[3] And carnivores are generally associated

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1 Merriam-Webster Dictionary (2016) defines a carnivore as (1) "an animal that eats meat"; "a meat eater" (simple definition), with the full definition (1) "any of an order (Carnivora) of typically flesh-eating mammals that includes dogs, foxes, bears, raccoons, and cats"; "broadly: a carnivorous animal", with the secondary meaning "a carnivorous plant". "Carnivorous", in turn, is primarily defined as "subsisting or feeding on animal tissues". In this chapter, by "carnivore" I mean a meat-eating animal, *i.e.* an animal that sustains itself to some extent (and in most cases primarily) by digesting animal tissue. As we see in Merriam-Webster's definition, the notion of carnivore is sometimes used in a stricter sense to refer only to animal species belonging to the mammal order *Carnivora*. But not all species in the order of *Carnivora* are carnivores in the sense of meat-eaters (the almost exclusively herbivorous panda is one example), and there are several meat-eating animals – and indeed some carnivorous plants and fungi – that do not belong to this order of mammals. I thus use the term "carnivore" in its broad scientific sense, but limited to carnivorous animals.

2 Taking a plant life is usually thought of as being radically different from taking an animal life, at least if the animal in question is sentient. Nevertheless, in the bigger picture the act of taking a life, or even feeding on plant parts without killing the plant organism, always has ecological repercussions, notwithstanding the fact that carnivorous behaviour typically leads to different population dynamics when compared with herbivorous behaviour.

3 In Merriam-Webster Dictionary (2016), a "predator" is defined as "an animal that lives by killing and eating other animals" (i.e., among carnivores in a broad sense, unlike carnivorous plants and fungi, only carnivorous animals are predators); "an animal that preys on other animals" (simple definition 1), with the full definition (2) "an animal that lives by predation", and with "predation" defined as "the act of killing and eating other animals"; "the act of preying on other animals".

with predatory behaviour, although, as we see, not all carnivores are predators. Predators thus form a subcategory of carnivores, and are correctly associated with killing – causing death, fear and, to varying degrees, suffering.

The act of killing can often, but not always, legitimately be associated with violence.[4] This is because the act of killing is not synonymous with an act of violence. Depending on the animal's cognitive capacity and overview of the situation, an act of violence may or may not be perceived as violent and/or life-threatening by the animal that is a victim of predation. A crucial difference between the taking of animal lives and the taking of plant lives is that whereas in the case of animals the feeding-related act is almost always perceived by the victim of the feeding, in the case of plants the feeding-related act is systematically perceived only by the eater. Any reference to 'violence' in the context of feeding presupposes that the feeding-related act can, at least in principle, be perceived both by the eater and by the victim of the eating. On the other hand, it does not necessarily presuppose that the animal being killed and/or eaten understands *who or what* it is that eats it.

Surely, some of the most severe acts of violence are concluded by morphing into acts of killing. But in the context of violence, it is crucial to distinguish between malicious intentions and, for example, feeding-related intentions. In general, when preying on other animals, predators *intend* to kill, but they do not kill because of any malicious intentions. Historically, predators have a reputation for being beasts ruled by hunger and are still looked upon as iconic murderers. But given the facts of the matter and considered in relation to predators' intentions in preying situations, it is unfair to regard them as icons of murder, and of murderers – for a murderer is, as tradition would have it, a killer with malicious intentions. Generally, an animal's motivation for killing another animal may be related, for example, to 1) defending oneself or one's kin, 2) competition with conspecifics or others, 3) feeding, or 4) exploration or fun – or a combination of some of these categories[5] (see Tønnessen 2009b for an analysis of domestic cats' *cruelty play,* e.g. with mice). Up to three of these four categories of motivation for killing another animal (1, 2, 3) are related to matters of life and death. In the cases where animals kill for fun, there is usually an element of learning involved. Both when animals kill for fun and when they kill to feed, they tend not to empathise

[4] "Violence" is in Merriam-Webster Dictionary (2016) defined, among other things, as "the use of physical force to harm someone" (excerpt of simple definition 1), or "exertion of physical force so as to injure or abuse" (excerpt of full definition 1a). However, the term is very often applied only to humans. Coincidentally, in a seminar at the University of Oslo on November 11th 2010, the internationally prominent criminologist Nils Christie (1928–2015) claimed that the term only makes sense with reference to human victims. However, if animal sentience is to be taken seriously, then animals, too, must in principle qualify as victims of violence.

[5] For instance, in some species infanticide may be motivated (to the extent that the rationale behind the act is somehow understood or felt by the animal itself) by a combination of 1) defence and 2) competition.

with their victims. Predators generally have selective empathy (though this claim may perhaps be made about any empathic creature whatsoever, since no creature on this planet is in every respect empathic). Most predators engage in radically different social relations (the term 'social relation' is here used so as to envelop all significant ecological relations with others, no matter of what nature), including social relations where empathy with kin and possibly others are central. But in killing situations, empathy is usually turned off, as it were.[6]

It is no mystery that farmers, hunters and others are provoked by predators when these attack animals in the care of humans. Naturally, people tend to empathise with "their animals", and to see them torn apart, killed or wounded by predators can leave mental scars, as it were, and can lead to hostile attitudes towards the perpetrators. Generally, conflicts related to predator management are often caused, in material terms, by depredation on humans (this hardly happens anymore in contemporary Europe), depredation on livestock or companion animals, and competition for prey or territory (see *4.1 Conflicts of interest: Whose prey?*). Additionally, many of those who are opposed to conservation policies are motivated by fear for their own safety or that of their loved ones.

The conservation of predators is often controversial, among other reasons because some predators hurt economic interests and livelihoods, and because they attack animals that are in our care and that we empathise with. At the same time, from the vantage point of ecology, predators are important components of functioning ecosystems, and, partly in consequence of this, are central in the context of biodiversity. If we were to draw a detailed global map of all the significant ecological relations of contemporary humans (cf. Tønnessen

[6] In Merriam-Webster Dictionary (2016), the secondary simple definition of "predator" is "a person who looks for other people in order to use, control, or harm them in some way". One might argue that even human killers are as a rule motivated by either 1) defence, 2) competition, 3) fun/exploration, or 4) feeding, or a combination of these factors. This would involve a desire to 1) defend oneself, kin, loved ones or core values, 2) defeat/overcome someone, 3) see what happens, or 4) feed, respectively. In the context where humans kill humans, being motivated by fun/exploration (3) or feeding (4) would generally be thought of as pathological, i.e. out of the ordinary. Being motivated by defence (1) and/or competition (2) would be much more common. While rape murders could be motivated by (1) and/or (3), and the act of killing oneself – suicide – most often as (1) (core values), examples of kills motivated by (1) and/or (2) include gang-related murders, robbery-related killings, revenge killings, honour killings, partner homicide, and war killings. One can observe that murderous intentions (that is, intentions to kill someone, for whatever reason), do not usually appear to involve malicious intentions as such – possible exceptions are represented by (3) and (4). In other words, though it might conceivably often occur as emotional flavouring of deeper motivations, a *desire to harm* does not, as a rule, seem to be the main motivation for killing another human being. Murders rather seem to be caused by too low regard for human life, by brutal/simplified value-related reasoning, and/or by misplaced loyalty. These observations make no claim on the validity/soundness of 'reasons to kill', but simply categorise different *perceived motivations* for killing another human being.

2011b: 102–103), we would realise that in effect we as a species predominantly have a highly negative relation to predators (see also section *4. The semiotics of predation*). This is, for one thing, because species that prey on animals that are of economic or emotional value to humans are generally treated as threats, pest species, etc., and because we tend in practice to care most for animals that we have some specific interest in. Conservation practices work like a counterweight to these deep-rooted tendencies.

Over the last generation or so, large carnivores have made a comeback of sorts in Europe after decades and centuries of extermination campaigns.[7] Given that conservation biology is of great importance to the future of large predators, I will in this chapter pay attention to various issues concerned with how conservation practices are carried out, as well as how ethology is conducted. "At the beginning of the twenty-first century", as King (2013: 153) observes, "behavioral research conducted by direct observations on wild animals appears to have fallen out of fashion". She explains this by the contemporary interest in technological means, such as trail cameras and telemetry collars. While the latter can give relevant information on habitat use and so on, such technological aids "provide few fine details of an animal's life" (King 2013: 153, cf. also p. 157). In King's view, "it is necessary to actively watch animals outside and be receptive to subtle environmental variations to understand their behavior" (King 2013: 153). These activities are time-consuming, but as she argues, nothing can replace them with regard to knowledge acquisition. In my experience, many zookeepers involved in the socialisation of wild animals are typically more knowledgeable of their behaviour than wildlife management professionals are. This is no mystery, given the time they have at their disposal with the animals and given the close contact they have with them. Such zookeepers also tend to get to know the animals individually.[8]

In this chapter, I will start out by describing or listing some of the study animals covered in the theme of large predator management. I will then outline the umwelten of large predators (which are today significantly affected by various management practices), with a focus on signification, communication and representation in the management of large predators. Next follows a case study on the wolf, one of the most emblematic large predators. This case study includes work on the symbolism of the wolf in the Norwegian context, as well as a more general sketch of the cultural semiotic of wolves and sheep (an animal that is often associated with the wolf). A fourth section addresses the topic of

[7] For a review of the recovery of large carnivores in Europe, one which argues that "large carnivores and people can share the same landscape", see Chapron *et al.* 2014: 1517. See also Boitani *et al.* 2015. For a recent paper on wolf resurgence, which refers to both eco-semiotics and landscape hermeneutics, see Drenthen 2016.

[8] Many tend to think that only some animals have personalities. But it is a telling fact that if you ask zookeepers that are attentive to the captive animals they look after, they will almost without exception report that they observe individual differences among the animals in their care, if only they spend enough time with them.

the semiotics of predation, with an emphasis on killing. This section treats the phenomena of predators killing prey, humans killing predators, humans as prey, humans as predators, and conflicts of interest. A fifth, concluding section deals with long-term vs. short-term goals for large predator management.

1.1. Study animals

Describing the study animals covered by a specific study always involves delineating, and usually involves justifying, why exactly the animals included in an analysis have been chosen, and not other but related animals. The study animals of this work are large predators among carnivorous mammals. They thus belong to the order of *Carnivora* in biological classification, but not all species of this order are included. Examples of predators that are excluded from this study include snakes, such as boas, cobras and pythons; birds of prey; crocodilians; and small carnivores, such as marten and the least weasel, among many others. All these animals feed by preying on other animals. But in terms of ecology and behaviour, large predators of the order *Carnivora* have a quite distinct footprint when compared to some other carnivores. For instance, large predators generally require larger territories than small predators, and they tend to be capable of attacking and killing larger prey. Furthermore, predatory mammals usually have some behaviours in common with humans, given that we as a species are also predatory mammals. Overall, this tends to mean that large predators among carnivorous mammals are more likely to get involved in conflicts with human interests than small predators are – and to get noticed by humans. They are therefore typically central players in human ecology and in the context of the contemporary environmental crisis.

In the Norwegian context (my home turf), large predatory mammals are represented by wolves, brown bears, wolverines and lynx (other noticeable carnivores include the Arctic fox and the golden eagle). In other parts of the world, large predatory mammals include tigers, lions, jaguars, leopards, cougars, coyotes and jackals, polar bears, and hyenas. Generally, predators may be divided into various subcategories, including *omnivores* (i.e. animals with a diet consisting of animals, plants, fungi and/or bacteria) and *apex predators* (i.e. predators on top of the food chain that are not preyed on by other predators). Notably, several animals sometimes act as a predator, other times not. This is the case, for example, with predators that alternate between predatory and scavenging behaviour – examples include wolverines and foxes. It is also important to note that the ecological roles of predator and prey are flexible in principle. Rumm (2015) tells the story of a captive tiger at a Siberian zoo and a goat that was originally left in his enclosure to be eaten. As this article shows, "predator and prey, stripped of the rules of the natural world, are actually well situated for friendship", since they "are already set up to know how to read each other", as Donna Haraway comments in Rumm's article.

The ecology of large predators among carnivorous mammals *in the wild*, whether or not they are to some extent managed by humans, is quite different from the ecology of large, predatory carnivorous mammals *in captivity*. For one thing, free-roaming carnivores live in much larger areas, and their interaction with the natural environment is less constrained by anthropogenic intervention than that of captive predators. Furthermore, captive predators are often not allowed to act on their predatory nature, but are instead fed by humans. This chapter deals with large, predatory carnivorous mammals in the wild that are subjected to various degrees of human management.

Domesticated animals may be a different story. Price (1984: 3, cf. 1998) defines domestication as "that process by which a population of animals becomes adapted to man and to the captive environment [he provides] by genetic changes occurring over generations and environmentally-induced developmental events reoccurring during each generation". In light of this definition, even companion animals such as the domestic cat, or dogs, may be regarded as to some extent wild and to some extent domesticated (with individual variation). Generally, large mammalian predators are quite prominent among captive animals in zoo environments (cf. Mäekivi's chapter in this volume), whether or not they are socialised (cf. Kiiroja's chapter in this volume). A special case, treated by Maran in this volume ("Semiotics and the Species Management Discourse"), concerns migrating carnivores that arrive in countries where they have not previously been present. In this latter case, the overall ecology might be somewhat different from that of residing free-roaming carnivores, and human perceptions of these animals might in some cases be radically different.

2. The managed umwelten of large predators in the wild

What all carnivores have in common is that they eat meat and that they hunt and/or scavenge. As a subcategory of carnivores, besides eating meat, large predatory carnivores – i.e. large carnivorous predators – have in common that they hunt and kill other animals. In terms of the four main functional cycles referred to by Jakob von Uexküll (cf. Uexküll 1928: 101) in his umwelt theory, predators are thereby characterised by the functional cycle that involves food. The key contrapuntal relation (Uexküll 2010: 171–181) involved in the umwelten of large predators is, from this perspective, that of predator and prey.[9] However, most carnivores eat plants, too, to a varying extent. *Mesocarnivores* are animals that predominantly

[9] This does not necessarily imply that the predators themselves experience relations with prey as more significant than relations with a partner or with kin, for example. From an intraspecific social perspective, it might very well be the case that as predators perceive it, those latter relations are of the greatest importance, whereas prey relations are more matter-of-fact.

eat meat but that eat substantial amounts of fungi, fruit or other plant material as well (30 to 50%). Examples of mesocarnivores include coyotes and foxes. *Hypercarnivores* predominantly eat meat to an even higher degree (at least 70% meat). Even wolves, however – one example of hypercarnivores – eat plants. In the Scandinavian context, it has been documented in practically all examined wolf territories that wolves eat berries and plant material, along with insects and small and large animals (Knappwost 2006; Müller 2006). Nevertheless, among large predators, the predominance of animals as a food source implies, for one thing, that animal-animal relations (including relations to other animal species) are central in large predator umwelten.

In general terms, Jakob von Uexküll (2010: 172) describes contrapuntal relations – for which predator-prey relations serve as a prominent example – in the following way:

> When two living beings enter into a harmonious relationship to each other, it is necessary first to make the decision as to which of the two organisms we want to speak of as the subject and utilizer of meaning and to which we assign the role of carrier of meaning. Then, we shall search for the mutual properties that behave toward each other as point and counterpoint. If, in a given case, we possess enough knowledge of the functional cycles that connect the respective subjects with their carriers of meaning and which can count as circuits of meaning, then we are enabled to search for the counterpoint on the perception side as well as on the effect side, in order to establish finally according to which specific meaning rule the composition was done.

The relationship between predator and prey might not appear to most people as an instance of "a harmonious relationship" (for a critique of Uexküll's outdated view on the balance of nature, see Tønnessen 2009a). However, when Uexküll calls predator-prey relationships "harmonious", his point is that from an ecological point of view, predator-prey relationships do contribute to maintaining ecological balance between different species, and even to the soundness of prey species (see below). As we see, in Uexküll's 'subjective biology', in each specific case we have to choose what animal's perspective we want to adopt. The fact that predators and prey participate in contrapuntal relations implies that their biological functions are sustainable, as it were. Predator X feeds on prey Y, and supposing that this practice can result in fairly stable populations of both predators and prey, such predation practices can be viable for very long indeed, if not literally indefinitely (since all animal species eventually go extinct). In what has been stated so far, Uexküll merely confirms common ecological knowledge. But moreover, Uexküll's claim that predator and prey are connected via a contrapuntal relation implies that their relation is not arbitrary but complementary and mutually (if asymmetrically) meaningful, and that the behaviour and perception of one is, through this relation, mutually adjusted to that of the other animal. This

exemplifies how an animal's behaviour and perception can never be studied in strict isolation, but rather must be studied in light of ecological relations that can explain the origin and development of both animal behaviour and perception.

Given that in Uexküll's scheme we can take, or investigate, the perspective of either the predator or the prey, it is quite obvious that the value or function of the act of predation is not similar in these two interrelated but very different cases. While the predator thrives when predation occurs, the individual prey suffers and perishes. In simple functional terms, the predator wins (temporarily), the prey loses (permanently). Just like the predator, the prey is also a utiliser of meaning – it is in all cases a subject, and at least in most cases a sentient subject.[10] This implies that the perception that is involved in the umwelten of predators and prey respectively has a radically different character in each of the two cases. While predators and prey usually recognise each other mutually (i.e., they *perceive* the other as a carrier of meaning belonging to the predator-prey contrapuntal relation), the character of the perception of the other differs fundamentally. Correspondingly, whereas the predator hunts and ultimately attacks, the typical behavioural reaction of prey is to either flee or fight back in a defensive fashion. In these terms, too, the experience of predation is very much distinct and asymmetrical, given the two respective perspectives: the predator prepares for a meal; the prey fights for its life.

To return to von Uexküll's notion of functional cycles, in the case of predators, the umwelt object in the functional cycle of food – i.e. the prey – perishes as an object in the umwelt of the predator either by escaping, by holding its ground, or, in successful depredation attempts, by being eaten (i.e. by literally being consumed). From the point of view of the *prey*, however, the predator perishes as an umwelt object in the functional cycle of the enemy either by being outrun or outsmarted, or by death or loss of consciousness (which might occur *before* being eaten by the predator, or *during* the predator's consuming act, depending on circumstances). If the prey animal dies, its whole umwelt collapses, as it were, and ceases to exist.

Von Uexküll distinguishes quite clearly between the subjective worlds of predators and prey, and other asymmetrical ecological relations. He stresses that

[10] One *could* argue that all prey animals are sentient. By definition, a 'prey' is an animal that some other animal is preying on, i.e. utilising as food. The prey animal is thus necessarily a victim. But can it suffer? The answer to this question is not one that can be given *a priori*, as some animal rights-inclined thinkers have done. In empirical terms, it is not the case that *all* animals are sentient (given that the term 'animal' is used in its scientific, biological meaning, and that 'sentience' is taken to imply consciousness and the ability to suffer as well as to feel well). The reason why one could claim that all prey animals are sentient is that when we think of prey, we think of an animal that is capable (in principle) of escaping the threatening predator. In order to display escape behaviour, an animal must arguably be sentient, since having conscious experience, and suffering when being physically hurt, might be a prerequisite for the ability to recognise something *as* a life-threatening predator, and then in response to try to avoid it. This would imply that all animals that display genuine escape behaviour – including fishes – are sentient.

in some cases, the prey species (or generally the apparently subordinate party) is not active as a utiliser of meaning, but only the predator (or generally the apparently superior party) is. At the face of it, the prey species is simply subjected to a meaning rule that makes sense *to the predator*. These kinds of meaning rules are in many cases related to what von Uexküll (2010: 182–185) refers to as the "sufferance of meaning". From the way things look, the apparently subordinated party is left to simply tolerate or suffer the apparently superior party's meaning. Von Uexküll thus refers (Uexküll 2010: 183) to "the great significance of the sufferance [tolerance] of harmful factors which exclude the weaker individuals again and again from the production of weak offspring". As an example, he writes (*ibid*.): "Hawks and foxes become benefactors of the species they hunt by snatching away the weak prey animals. Where foxes are eliminated, hares go under due to epidemics, because the sick animals were not culled at the right time". On a more general note, von Uexküll (2010: 185) observes that "[t]he sufferance of meaning wipes out the excess of individuals in the interests of the species, whereby all unhealthy and poorly resistant individuals are cast off; or the removal of the excess individuals happens in the interests of Nature's economy". Von Uexküll's main point here is that in the bigger (i.e. ecological and evolutionary) picture, meaning rules in predator-prey relations make sense for both parties involved, even though the *individual* prey suffers and perishes.[11]

The rest of this section deals with the semiotic phenomena of signification, communication and representation in the management of large predators, and in the umwelten of large predators in the wild. Human management may have an impact on the lives of large predators in numerous ways, directly through management of predators and indirectly through human management of prey species or other wildlife or through human practices that affect the landscape. Furthermore, given that humans are perceived as enemies by many predators, humans impact the lives of large predators by their very presence and activities in nature.

2.1. Signification in the management of large predators

Before embarking upon the sketching of signification, communication and representation in the management of large predators, these three semiotic notions should be defined. In Tønnessen and Tüür (2014: 12), which draws on Martinelli (2010, part 1.1), semiosis, or sign exchange, is understood in terms of senders and receivers of signs. In this perspective, *communication* can be understood as a sign exchange between a sender and a receiver, *signification* as semiosis in the

[11] Von Uexküll (2010) remarks that Herbert Spencer (1820–1903) made a "fundamental error" in his evolutionary theorizing. "[A]nnihilation of surplus offspring […] is hardly a matter of the survival of the fittest, but rather, of the survival of the normal in the interests of an unchanging further existence of the species".

absence of a true sender, and *representation* as semiosis absent of a true receiver. This implies that whereas communication involves at least two subjects, a sender and a receiver, signification involves semiosis that is accessible first-hand only to the receiver (and that there *is* only a receiver in the meaning-making situation), while representation involves semiosis that is accessible first-hand only to the sender (and that there *is* only a sender in the meaning-making situation). The fundamental difference between signification and representation is that while in signification meaning is experienced and possibly explored by the animal or human (but is not of its own creation), in representation meaning is actively construed by the representing subject.[12]

According to Uexküll (2010: 27),

> [t]he mute interaction of one thing with another opens the possibility of signification, especially in the living, where material complexity and thermodynamic lag ensures that the appearance of one substance will follow another. The simplest and best example of this is food, as it "represents" the attended-to substrate on which an organism's continued livelihood depends.

Food, in other words – or nutrition – is no random example of objects of signification, i.e. perceived objects. When von Uexküll portrayed food as the object of one of four generally occurring functional cycles, it was exactly because practically all living organisms depend on tracking down and recognising what they can utilise as food. This is clearly applicable to predator-prey relationships. However, whereas for predators, prey have the functional tone of food (i.e., when predators encounter prey, they associate the prey animal with food and eating), for prey, predators have the functional tone of an enemy, a lethal threat (so when prey encounter predators, they associate the predator with danger and a need for escape or defence). In some cases, such as when a moose defends itself against a wolf attack by kicking a wolf, the roles can change, to the effect that the predator perceives an enemy and not simply latent food. Depending on whether or not the predator in question is a social hunter, the predator may or may not perceive fellow, conspecific hunters as part of the whole depredation experience. For social hunters, the hunt is as a rule always a social event besides being feeding-related (the same holds true for most human hunters, and no less so in contemporary times, given that modern hunters' survival does not depend on their hunting practices).

The topic of predators and prey (and of their management by the human hand) involves a lot of different umwelten, and no satisfying account of all these

[12] However, in practice this difference is often blurred, since some representations are in turn perceived and interpreted by others (especially in the context of human culture). It is arguably the case that e.g. human "reading" of representations of animals involves an element of co-creation based on one's own experience.

can be given here. Constellations of perceiving subjects and perceived objects include wildlife manager-predator, wildlife researcher-predator, representative of the public-predator, prey-predator, predator-prey and predator-humans. In the following, I will focus for the most part on giving a rough outline of how predators perceive and relate to humans. As mentioned, humans are treated as enemies, threats, by many predators. This can cause conflict, but more often results in avoidance behaviour, which can affect a broad spectrum of behavioural patterns.

As Bouyer *et al*. 2015 have found, anthropogenic environmental change, including forest fragmentation and transport infrastructure as well as the mere presence of humans, significantly influences lynx behaviour. Previous studies, they claim (*ibid*., 291), "have not examined the extent to which lynx modify their fine scaled avoidance behavior of anthropogenic landscape features according to the specific behaviors (resting sites, kill sites, movement) in which they are engaged".[13] On a more general note, they observe that "[t]he response of large carnivores to human activity is conceptually similar to a prey species' response to predation risk" (*ibid*., 291; cf. Samia *et al*. 2015: 2).

In wolf ecology, Wam (2003) found that almost all wolves that are approached by a human in the wild run away immediately. She estimates the chance of a hiker being confronted by a wolf in Scandinavia as practically nil. In effect, whereas wolves quite often perceive the presence of a human, humans seldom perceive that there is a wolf nearby (unless they are researchers or wildlife managers with special equipment). "Human disturbance", Samia *et al*. (2015: 1) remark, "drives the decline of many species, both directly and indirectly. Nonetheless, some species do particularly well around humans". They suggest that a decisive factor in this context is "the degree to which a species tolerates human disturbance" (*ibid*.), and found that "[h]erbivorous and omnivorous species were more tolerant [of human disturbance] than carnivorous species" (*ibid*., 2–3). This confirms the impression that carnivores generally avoid humans. In large predator management, the extent to which predators encounter managers or researchers (as opposed to hunters or other representatives of the public) depends on the management methods applied, especially with regard to tracking and technology. In the North, large predators can be tracked on snow in the winter season. Other non-invasive methods include genetic sampling based on "genetic sources left behind by wildlife (such as hair, feathers, urine, or feces)" (Bischof *et al*. 2015: 2). The latter methods are now widespread "for monitoring large terrestrial carnivores, especially members of the *Felidae* […] *Canidae* […], and *Ursidae* […], without the need to physically capture individuals" (Bischof *et al*. 2015: 2). Unlike with invasive, capture-based methods such as GPS-tagging, non-invasive methods allow for tracking and monitoring large predators without invading, as it were, the umwelten of those predators.

[13] For more information on their findings, see subsection 4.1 Conflicts of interest: Whose prey?

2.2. Communication in the management of large predators

Communicative relations occur in several different configurations in the context of the management of large predators. Among predators, communication may occur among conspecifics that either cooperate in hunting situations (this is particularly relevant if the predators attack in groups) or compete for prey (this is particularly relevant if the predators hunt individually, or if prey animals are attacked by competing groups of predators). Of course, predators have a life beyond depredation situations as well, and unless the predators are solitary (or in a solitary phase), this usually involves close social relations with conspecifics, where nuanced and rich communication is key to establish, uphold and develop/challenge relations. For carnivorous large mammals, social phenomena include breastfeeding, and significant social relations of at least a temporary nature include that between mother and offspring.

Among prey animals, communication may precede predatory attacks, as in the case of warning signals, or it may coincide with the act of predation. Several animal species also take advantage of, for instance, the warning cries of other species by gathering information and acquiring situational understanding. Between predator and prey, the predator may in some cases try to fool the prey by communicating on false, deceptive terms, and some prey may likewise try to get out of the situation either by communicating deceptively or by evoking the impression of significant defensive abilities.

When humans are involved, human–animal communication might occur, e.g. between a human hunter and a hunted animal, between wildlife managers and managed animals, or between representatives of the general public and large predators under official management in the rare cases where people encounter large predators in the wild. In modern large predator management, humans often have the upper hand. When a large predator is GPS-tagged and traced by helicopter, it does not stand a chance. In such situations, there is a breakdown of normal communicative relations, and the animal is overrun, as it were (see Tønnessen 2010b). Finally, there is a whole range of interspecific human communication, i.e. communication among humans (including both in-group and inter-group communication), *about* large predators. This is a topic in its own right.

Since communicative relations occur in so many different configurations in the context of the management of large predators, it is hard to say something substantial of a general nature. But humans and animals alike depend on communication, each in their own context. And when communication is cut off, relations may suffer. This might perhaps be a guideline for large predator management as well, with validity for relations to the public, as well as for human–animal communication in the field.

2.3. Representation in the management of large predators

"Animal representations" might be taken to mean human representations of animals – of which there are plenty, and on which any culture is arguably in part based. However, if one regards animals as cognitively capable of forming representations, there are of course animal representations in a different sense, too – namely animal representations of humans,

> encapsulating the ways in which we humans are collectively or individually represented by certain figures in the *umwelten* of various animals. These perceptions, too, are in a sense anthropogenic. Many of these 'human representations' are arguably "signs of danger" – at least in the case of many wild animals. Friendly, responsive human representations held by animals must as a rule be contingent on animals' experience with comparably friendly human behaviour in encounters with the human kind. (Tønnessen, Tüür 2014: 17)

Human representations of large predators constitutes a corpus of gargantuan proportions (see subsections *3.1 The wolf as symbol* and *3.2 The cultural semiotic of wolves and sheep* for a few examples). In conservation discourses, relevant keywords include flagship species, charismatic mammals, and more generally symbols and icons of conservation. Management discourses are often focused on political conflicts related to predators. "Large carnivore conflicts", sociologist Skogen (2015) observes, "are embedded in deeper societal tensions, and this is particularly obvious concerning the conflict over wolves". In consequence, representations of wolves and other large predators are often influenced by representations in entirely different discourses. "People who oppose wolf protection", writes Skogen (2015), "are often much angrier with their human adversaries than with the animals, and the conflicts reach beyond controversies over management practices […] These attitudes are not always – or even predominantly – related to adverse material effects of wolf presence".

In a narrower sense, management discourse addresses practical issues related to management practices, e.g. the monitoring of large predator populations. One question in this context is whether the population estimates that conservation policies and management practices are based on are accurate. One difficulty, in the European setting, is that the monitoring of predators, and indeed management aims and measures, tend to follow national borders, whereas several large predators, including wolves and bears, do not. As Bischof *et al.* (2015: 1) point out, "wild animals often move freely between jurisdictions". Their key example is brown bears in Norway. Comparing population models that either ignored or recognized the difference national borders can make, these researchers found (*ibid.*) that "[n]ot accounting for detections of 'foreign residents' resulted in abundance estimates that were inflated by as much as 119%". Up to half of all

female bears appearing in Norway turned out to "have their center of activity in neighboring countries (Finland, Russia, and Sweden)" (*ibid.*). Bischof *et al.* (*ibid.*, 5) warn that "[n]aïve estimates on each side of a political border may easily lead to double-counting of a substantial portion of individuals in a transboundary population", and they conclude (*ibid.*, 7) that "[g]iven geopolitical reality, widespread population-level management of transboundary wildlife populations may be an ambitious, possibly utopic, long-term goal, but quantifying, and thus managing, wild populations with the recognition that they are shared with other jurisdictions is a step that can be taken today".

3. Case study: wolves[14]

This section, featuring a case study on Scandinavian wolf management, will briefly present the wolf as a symbol, with emphasis on the Norwegian context, and will also give a more general overview of the cultural semiotic of wolves and sheep. The section on the symbolism of the wolf is focused on conflicts with sheep husbandry, despite the fact that conflicts with hunters and, notably, hunting dogs might be equally important as persistent triggers of controversy. This is because it is arguably first and foremost the wolf/sheep symbolism related to open landscapes that in the Norwegian context have molded public perceptions of the wolf. First, however, I will present a little background on the situation for wolves in Norway and Scandinavia.

According to Svensson *et al.* (eds.) 2015, on the last count there were ca. 460 wolves in Scandinavia, most of whom were on Swedish territory. There were 41 family groups in Sweden, five on the border between Norway and Sweden and three in Norway. Practically all of these wolves, apart from a few migration events further north, are located in southern Scandinavia. The Norwegian wolf population amounted to 33–35 individuals in Norway and an additional 40 wolves on the border. Policy reviews have recently been conducted in both Norway and Sweden. In Norway, the population target (three litters per year inside the "management area for breeding wolves", popularly called the 'wolf zone') was reached for the first time in 2010. The 'predator settlement' of June 2011 garnered support from all parties in parliament – and yet the controversy around wolf management has far from abated. The official Norwegian policy remains that the country should sustain populations of wolves as well as of brown bears, lynx and

[14] This section is largely based on chapter 4 in Tønnessen 2011c (pp. 49–73). Specifically, the introduction to *3. Case study: wolves* is for the most part adapted from Tønnessen 2011c: 49–51 (4. Case study: Norwegian wolf management), *3.1 The wolf as symbol* is adapted from Tønnessen 2011c: 71–73 (4.5 The symbolic construction of the Big Bad Wolf in contemporary Norway), and *3.2 The cultural semiotic of wolves and sheep* is adapted from Tønnessen 2011c: 56–66 (4.2 The cultural semiotic of wolves and sheep).

wolverines, while simultaneously safeguarding grazing livestock, notably sheep and reindeer. Norwegian and Swedish management is quite closely coordinated, although policy differences have occurred, including those concerning hunting measures. Among the questions still to be solved is whether wolves living on the Norwegian-Swedish border should be counted as part Norwegian. The wolf zone, which covers only 4% of Norway, is also currently under review, with small adjustments being considered.

Relations between wolves and other involved parties, such as sheep, dogs or humans, may be described by using Uexküllian models of the umwelt. Of particular relevance here is the modelling of changes in relations. An *umwelt transition* (Tønnessen 2009a) is defined as "a lasting, systematic change, within the life cycle of a being, considered from an ontogenetic (individual), phylogenetic (population-, species-) or cultural perspective, from one typical appearance of its Umwelt to another" (*ibid*., p. 49; cf. chapter 2 in this volume). Umwelt transitions can in principle be depicted figuratively very easily by juxtaposing the four main phenomenal fields (cf. Uexküll 1982[1940]: 33; Brock 1939) representing functioning *before* a specific change and another set of phenomenal fields representing functioning *after* the change has occurred. The evolutionary phenomenon of wolves becoming dogs is depicted in Figure 1.

While in the initial umwelt situation a wolf relates to humans as enemies, in the eventual umwelt situation a dog (the evolutionary product, after numerous generations) relates to humans predominantly as a partner, as in 'social companion', and only marginally as an enemy. Much more detail could have been depicted by presenting a more extensive series of fields in gradual transition.

Figure 2 depicts a summary of fairly recent changes in the way in which humans, more specifically Norwegians in contemporary times and the near future, relate to wolves and to sheep. The wolf has become less of an enemy (though in the eyes of a substantial minority it *remains* an enemy) and has become a partner, as in a *conceptually perceived* social companion, to many contemporary Norwegians. The sheep, which has traditionally been both food and partner (as in social companion), is now becoming less of a partner due to steadily increasing ratios of the *number of sheep* to *number of sheep farmers*. This is related to the ongoing industrialisation of animal husbandry. As we see in Figure 3, this latter development points in the direction of a future in which humans might ultimately vanish altogether as umwelt objects in the umwelten of sheep.

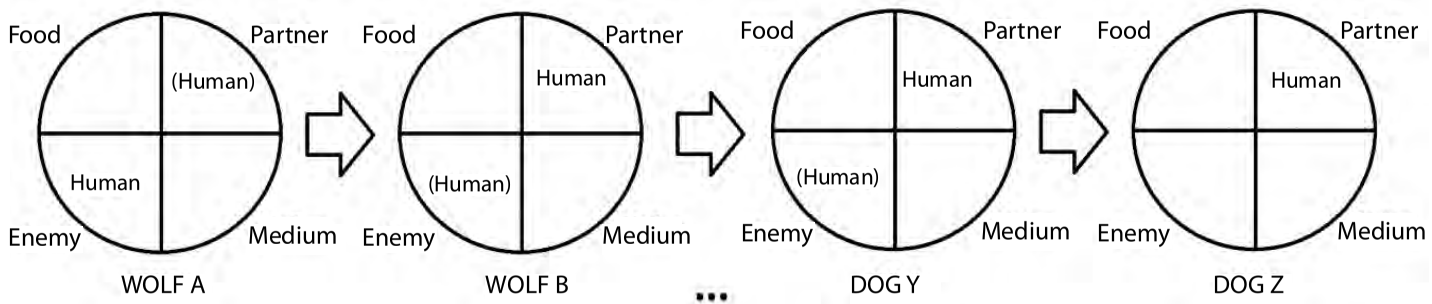

Figure 1. Umwelt transition – wolves becoming dogs – depicted over several steps.

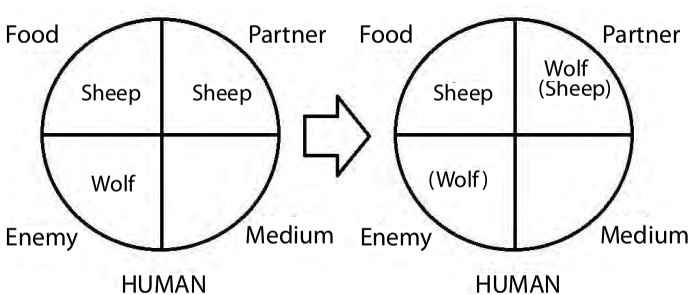

Figure 2. Umwelt transition in human relations to sheep and wolves.

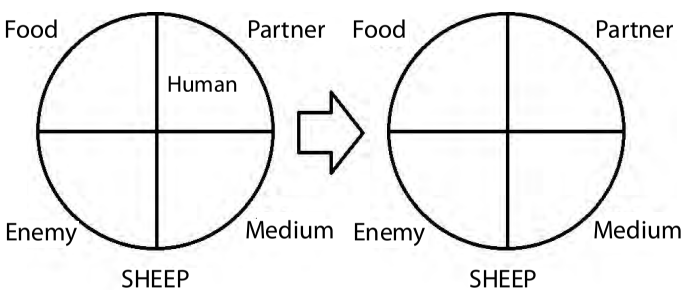

Figure 3. Umwelt transition in the relation of sheep and humans (overstated).

3.1. The wolf as symbol

The backdrop for the marginal but considerable resistance to the conservation of wolves and other large predators in Norway is the fact that industrialisation in agriculture is threatening traditional animal husbandry practices. "In reality", as stated in Tønnessen 2011a (p. 318), "the wolves are not blamed for the sheep they kill – they have come to symbolise the threats, dangers and decline facing Norwegian agriculture. The wolf, in short, has become a scapegoat".

In cultural terms, hardly any animals are as loaded with symbolic value as the wolf and the sheep (see also the next section, *3.2 The cultural semiotic of wolves and sheep*). And the shared importance is no coincidence, since the symbolism of the two animals has frequently developed in explicit opposition to each other. In the Scandinavian context, the wolf's vivid symbolism in current times is enforced by the occurrence of conspiracy theories (cf. the quite widespread conviction that Scandinavian wolves have been secretly and purposefully reintroduced, described in Tønnessen 2010a: 292). Many of the fiercest opponents of wolf conservation believe that researchers and the authorities intentionally misrepresent the population number of wolves, and they distrust official reassurances that the wolf does not pose much danger to people. In result of this and other developments, human perceptions of wolves have in large measure decoupled from ecological reality.

It is telling that whenever national Norwegian media cover predation on sheep, the wolf is typically pictured for illustrative purposes – despite the fact that wolverines, lynx, and brown bears all account for a much greater percentage of predation on sheep. According to Rovbase, a public database for predator monitoring in Norway, in the period of 2010–2014 wolves accounted for only 7% of predation on sheep, whereas the other large predators combined accounted for 93%. What this shows is that the wolf has become a poster boy, as it were, for large predators in general. What wolves are taken to signify depends not so much on actual wolf ecology as it does on certain cultural/societal developments. These are, justly or unfairly, associated with the presence of wolves and with governmental conservation policies. For many rural dwellers, wolf management has come to symbolise the alleged ignorant hostility and unjustly interventionist tendencies of the urban elites.

The sheep's symbolism is, in the Norwegian context, grounded in open landscapes, which are typically taken to be intrinsically Norwegian. The idea of the Norwegian nation is built on the memory of an initial clearing and cultivation of the original (pre-Norwegian) landscape. We see this plainly in the two first verses of Ivar Aasen's "The Norwegian", which is in effect treated as a national anthem (my translation, in literal form).

> Between hills and mountains out by the sea
> the Norwegian has been given his home,
> where he himself has dug the foundations
> and himself put their houses on top of them.
>
> He looked out at the rocky beaches;
> there was no one, who there had built.
> "Let us clear a place and build dwellings,
> and so we own the clearing safely."

The symbolism of sheep in Norway is effectively associated with the symbolism of outer pastures, which have been crucial in Norwegian sheep husbandry but are now under pressure. A key reason is the general move from extensive to intensive farming practices. A common perception in rural areas is that outer pastures are being devalued, and that traditional, small-scale Norwegian farming practices are under threat. In visual imagery, this is best expressed by a phenomenon called 'gjengroing', imperfectly translated to English as 'overgrowth' and content-wise accurately translated as 'reforestation'. Overgrowth in this sense implies that an originally open, cleared landscape is taken over by weeds and other vegetation with no direct agricultural value. Such a landscape, with growing irrelevance (so to speak), reduced utility and – notably, in perceptual terms – an obstructed view, has become a symbol of the hardships of rural areas and of Norwegian agriculture. A sound hypothesis is that it is the idea of the changing landscapes as being symbolic of rural troubles and the loss of traditional livelihoods that is fuelling and reinforcing the wolf's negative symbolism and the apparently neverending conflict over wolf management. In short, the return of large predators, and especially the wolf, is often blamed for this 'overgrowth', i.e. for the disappearance of open landscapes as outer pastures are going out of use, partly due to fear of predation. Without grazing animals – so the idea goes – cultural landscapes that have traditionally been used as outer pastures 'overgrow' (or are "rewilded", as we could say with a more positive emphasis).

Even though there is indeed an actual process of reforestation in contemporary Norway, it should be noted that it is not at all reasonable to assume that this phenomenon is predominantly caused by predator management in general or wolf management in particular. The fact that Norway as a whole is gradually being reforested is first and foremost a result of natural growth in the wake of deforestation that took place until late in the 1800s, and secondarily a result of anthropogenic climate change. Regardless of these factual matters, a landscape in transition has become a powerful symbol of the defeat which many in rural Norway feel subjected to – a defeat for lifestyles and farming methods alike, in local communities that tend to be in areas that are abundant in space and natural diversity but less so in people and immediate opportunity.

3.2. The cultural semiotic of wolves and sheep

The noun 'wolf' refers in its primary sense to various predatory carnivorous mammals of canid species of North America and Eurasia that usually hunt in packs, or, in a narrower sense, only to *Canis lupus*, the grey wolf. In Greek the word for wolf is transcribed as 'lykos' (as in λύκος), in Latin the word is 'lupus', in Spanish and Portuguese 'lobo', in French 'loup', in Italian 'lupo', in Danish, Norwegian and older Swedish 'ulv' (but in contemporary Swedish 'varg'), etc. A second meaning of the word wolf is, in the words of the Merriam-Webster Dictionary (2016), "a man given to seducing women" – synonyms include 'Casanova' and 'womaniser', related words and phrases include 'ladies' man', 'seducer', 'whoremaster' and 'whoremonger'. Wolves have symbolised lust for more than two thousand years. In Roman slang, lupa, literally female wolf or she-wolf, meant 'whore', a connotation that is found even today in the Spanish loba, the Italian lupa and the French louve. In Anglo-Saxon culture, 'wolf' was equated with 'prostitute' or a 'sexually voracious female', but later it came to signify a 'sexually aggressive male'. This latter use was first recorded in 1847 (Online Etymology Dictionary). In this context, we should also recall that *bitch* (cf. the insult "son of a bitch") literally means 'female dog' or the female of other canines, such as wolves and foxes.

A third meaning of the word wolf is, according to the same dictionary, "a person who habitually preys upon others" – synonyms include 'bloodsucker', 'shark', 'vampire' and 'vulture', related words include 'exploiter', 'destroyer' and 'devourer', while the antonym is said to be 'prey'. The verb *to wolf*, which might be taken to mean "to eat like a wolf", is defined by Merriam-Webster Dictionary (2016) as "to swallow or eat greedily" – synonyms include 'devour', 'gulp', 'inhale', 'scoff' and 'slop'. In Old Norse, *vargr* (cf. the Swedish varg) meant 'outlaw', almost as in the Old English *wearg*, 'criminal', 'felon'. It was also used in the sense of 'murderer', 'slayer'. In Norse society, varg signified not only the particularly murderous 'slayer wolf' that wreaked havoc on herds, but also a human outlaw, a person one would not be punished for killing. Another term that due to its cultural impact must be mentioned is that of the werewolf, also known as a 'lycanthrope' (from the Greek 'lykos', 'wolf', and 'anthropos', 'man'). In contemporary times, terrorists that act on their own are often referred to as 'lone wolves'.

People whose names draw on the wolf include the Cheyenne war leader Little Wolf, the author Virginia Woolf (1882–1941), posthumanist Cary Wolfe, American journalist Wolf Blitzer, Wolfgang Amadeus Mozart (1756–1791), Adolf Hitler (1889–1945), Adolf of Nassau (1255–1298) and various kings of Sweden and European dukes and princes, and three saints (Spanish, German and Ugandan), among countless others. During the Second World War, 'Werwolf' signified a Nazi plan designed by Joseph Goebbels from 1944 and gone public by March 1945. There are also numerous place names that make reference to wolves, e.g. Wolverhampton (UK).

In the works of William Shakespeare, the word "wolf" appears in no less than 20 of his plays, first of all as embodying hunger and as the iconic predator (for example, in *Twelfth Night*): "If one should be a prey, how much the better / To fall before the lion than the wolf!"). The wolf is embodied hunger – predatory hunger – pure hunger. Generally, a majority of expressions making reference to the wolf are implicitly morally condemning or otherwise portray the wolf in bleak terms. The wolf is an animal associated with violence, plotting, unruly hunger, and loneliness. The wolf-whistle, a two-toned sound that might or might not be made by 'wolf-whistling', i.e. inserting two fingers into the mouth in order to produce a loud and penetrating tone, is one of the examples that do not fit with this picture. Being used to approach, to compliment, or possibly to mock a sexually attractive person, the wolf-whistle belongs instead to the category of sexual connotations.

The mythical founders of the city of Rome, Romulus and Remus, had according to tradition been suckled by a wolf before they were found by a shepherd. Here, then, we face a narrative in which a wolf saves the lives of two children who would later grow to be great men. It is also noteworthy in our context that the two twins were later retrieved by a shepherd, a caretaker of sheep – and brought up to become shepherds themselves. In Norse mythology, Fenrisúlfr, or Fenrir, is the name of a wolf, a son of Loki (by birth a gargantuan troll of sorts, later a god and certainly a trickster – a shape-shifter for sure). Great malice was expected from Fenrir. He is foretold to kill the god Odin during Ragnarok, the Norse end of times, and one of Fenrir's sons would swallow the sun and another the moon.

The imagery of the Bible has certainly been influential in shaping Western perceptions of the wolf, especially when contrasted with the Bible's treatment of sheep and lambs (all quotes in the following are, unless otherwise noted, from the New International Version, 2010). The phrase "wolf in sheep's clothing" originates from the Gospel of Matthew, 7:15, where Jesus is recorded as having said in a sermon, "Beware of false prophets, which come to you in sheep's clothing, but inwardly they are ravening wolves" (King James Version). In John 10:11–16, where Jesus presents himself as the good shepherd, the wolf is again juxtaposed with sheep.

> I am the good shepherd. The good shepherd lays down his life for the sheep. The hired hand is not the shepherd and does not own the sheep. So when he sees the wolf coming, he abandons the sheep and runs away. Then the wolf attacks the flock and scatters it. The man runs away because he is a hired hand and cares nothing for the sheep.
>
> I am the good shepherd; I know my sheep and my sheep know me –
> just as the Father knows me and I know the Father—and I lay down my life for the sheep. I have other sheep that are not of this sheep pen. I must bring

> them also. They too will listen to my voice, and there shall be one flock and one shepherd.

Later on, in John 10:25–28, Jesus says that "[t]he works I do in my Father's name testify about me, but you do not believe because you are not my sheep. My sheep listen to my voice; I know them, and they follow me. I give them eternal life, and they shall never perish; no one will snatch them out of my hand". In the book of Isaiah, there are two passages where mention of the wolf is made to portray paradise, first Isaiah 11:6: "The wolf will live with the lamb, / the leopard will lie down with the goat, / the calf and the lion and the yearling together; / and a little child will lead them". Isaiah 65:17–25 offers a similar image, in partial repetition of Isaiah 11: "See, I will create / new heavens and a new earth […] The wolf and the lamb will feed together, / and the lion will eat straw like the ox […] They will neither harm nor destroy / on all my holy mountain, / says the LORD". Given that the wolf is associated with unruly, violent hunger, it does make sense to envision a vegetarian wolf as symbolic of heavenly peace and an end to all conflict. Vegetarian predators might be a contradiction in terms, but this succinctly symbolises an otherworldly state of affairs.

Both the adult sheep and the lamb play a decisive role in Christian imagery. Jesus is not only likened to a shepherd but also to a lamb. The Latin term *Agnus Dei*, lamb of God, refers to Jesus Christ in his role as a global paschal lamb, offering – sacrificing – himself for the sake of humanity. In Christian iconography, he is sometimes depicted as a lamb, occasionally as a bleeding lamb. In English-speaking liturgy, there are several variations over a theme such as this one: "Lamb of God, you take away the sin of the world, have mercy on us".

In "The Parable of the Lost Sheep" (Luke 15:1–7), a 'lost sheep' is likened to a sinner who repents. In Matthew 25:31–46, a decisive distinction is made between sheep and goats in a discourse by Jesus. This time around, the sheep represent the blessed, those who will inherit heaven, whereas the goats represent the cursed, those who will not (or worse) – cf. the iconic image of the devil as a man with "goat-beard" and horns.

> When the Son of Man comes in his glory, and all the angels with him, he will sit on his glorious throne. All the nations will be gathered before him, and he will separate the people one from another as a shepherd separates the sheep from the goats. He will put the sheep on his right and the goats on his left. Then the King will say to those on his right, 'Come, you who are blessed by my Father; take your inheritance, the kingdom prepared for you since the creation of the world.' […] Then he will say to those on his left, 'Depart from me, you who are cursed, into the eternal fire prepared for the devil and his angels.' […] Then they will go away to eternal punishment, but the righteous to eternal life.

As we have seen in these last two sections, the wolf's symbolism is rich and complex, with room for historical and local variations. It is very likely that some of the age-old sheep/wolf symbolism comes into play in the contemporary Norwegian discourse on wolf management, at times perhaps as part of the "collective unconscious" currents of our culture. At the same time, we have seen, in *3.1 The wolf as symbol*, that the wolf's symbolism is in the Norwegian context predominantly landscape- and culture-specific, and is related to recent and contemporary economic and ecological changes. Generally speaking, we can observe that symbolism formation related to human–animal relations tends to occur at different scales simultaneously, with regard to both time scales (long-term vs. short-term, historical vs. contemporary, etc.) and cultural-geographical scales (Western vs. Norwegian, national vs. regional, urban vs. rural, etc.). Conceivably, any culture has a reservoir of symbolic representations that may for the most part be latent but where specific representations may at some points be resuscitated (activated) by current events and developments, whether these events are natural, as it were, or deliberately framed so as to provoke changes.

4. The semiotics of predation

As we have observed, predators kill. More often than not, so do human beings in their large predator management. Ethical dilemmas arise when individuals of threatened species are killed in the name of conservation of the species. At any rate, the *semiotics of killing* concerns not only large predators but also people involved in large predator management.

Large predators kill because they have to kill in order to sustain themselves. Why do people involved in large predator management kill or facilitate the killing of large predators? Often because they think it is inevitable, necessary. Here we must bear in mind that *Homo sapiens*, too, is a carnivore – even if an omnivore in principle and by physiological design – and, in extension of this, is a predator. We too have been killing other animals for ages – most often as a way to sustain ourselves, but also extensively in contexts of competition with other species. As a result, several species of large predators have been driven to extinction. In current times, however, when we kill specimen of threatened large predators in the name of conservation, our intent is not to harm the species, even though the individual specimen is killed. Individuals that are killed off are often referred to as "problem individuals" that have caused material damage or human hostility (or they are killed for the sake of the conservation of another, competing species, which is especially the case with exotic and so-called "invasive species"). However, the "problem" associated with so-called problem animals might in many cases have its origin in human perceptions just as much as in actual animal behaviour.

The starting point for a new conservation movement that has surfaced in the last few years, in favour of *compassionate conservation*, is to "first do no harm" (see Bekoff 2013: xxi). As a matter of fact, as Bekoff (2013: xiv) points out in reference to Collins and Kays 2011, humans are today "the major cause of mortality in North American populations of large- and medium-sized mammals [51.8%]", and this accounts for "the most deaths in larger North American mammals, including those living in *protected* areas (34.6 percent)". In the context of Scandinavian wolf management, Olsen (2003) found that about four out of five wolves covered by her study had died due to legal or illegal hunting, traffic accidents or other human causes. Fox (2013: 119) writes that in 2010, "the USDA Wildlife Services killed more than five million animals in the United States – including 113,000 mammalian carnivores". Of the latter, a majority occurred in so-called lethal coyote control.

Bekoff (2013: xx) states that we need to ask some hard questions, including these: "Should we kill in the name of conservation or research? Should individuals be traded off for the good of their own or other species or for ecosystem integrity?" The slogan of the compassionate conservation movement, "first do no harm", generally indicates that it favours minimising anthropogenic mortality (see section *5. Long-term vs. short-term goals for large predator management*). This would, on an ideological level involving normative ethics, encompass systematically combining environmentalism (including conservationist thought) with concerns for animal protection, or in other words combining an attribution of moral status at systemic levels with an attribution of moral status to individuals.

As Vucetich and Nelson (2013: 15) state,

> one of the greatest developments in twentieth-century ethics has been the development of reasons to think that nonhuman animals and ecological collectives deserve direct moral consideration. Society's appreciation for these reasons is increasingly apparent (e.g., Animal Welfare Act and Endangered Species Act). The ethical thing to do is not to deny the validity of one of these moral developments but to work toward an ethic that accommodates [the conflict between the needs of conservation and the welfare of individual animals].

Baker (2013: 163) indicates that resolving both animal welfare and conservation challenges is made easier by attending to animals as individuals in conservation practices also. In her understanding, conservation biology's neglect of the individual animal "reinforce[s] the conservation movement's traditional emphasis on 'ecological collectives' (populations, species, ecosystems) rather than individuals" (*ibid*., 160). Vucetich, Bruskotter and Nelson (2015) observe that "[t]he origins of conservation biology as an academic discipline are explicitly rooted in the notion that nature possesses intrinsic value" (*ibid*., 1), and they "conclude that nature's intrinsic value is not a vacuous concept or adequately

accommodated by economic valuation" (*ibid.*). This latter point is shared by Darimont *et al.* (2015: 858), who remark that "[p]aradigms of sustainable exploitation focus on population dynamics of prey and yields to humanity but ignore the behavior of humans as predators". Vucetich, Bruskotter and Nelson note (*ibid.*, 7) that "believing that a bear, for example, possesses intrinsic value does not mean killing a bear is always or necessarily wrong, but it does mean one would have to provide a compelling reason for doing so".

The hunting pressure that large predators are subjected to can be divided into legal and illegal hunting. The extent of both types of hunting by humans is considerable for most species of large predators.[15] Overall, the ecological impact of humankind globally is now so considerable that more and more researchers are referring to our current geological epoch as *the Anthropocene*, the era of mankind.[16] Darimont *et al.* (2015) discuss the unique ecology of human predators in comparison with other predators. Their global survey found that "humans kill adult prey, the reproductive capital of populations, at much higher median rates than other predators (up to 14 times higher), with particularly intense exploitation of terrestrial carnivores and fishes" (*ibid.*, 858). The data shows that human hunters exploit mesocarnivores at 4 times higher rates than do nonhuman predators, and large carnivores at 9 times higher rates. According to the study, nonhuman predators typically target juvenile prey (*ibid.*, 859), which does not have the same ecological effects. Our impact on predators in particular, and our high exploitation rates overall compared to other predators, are among the factors that lead Darimont *et al.* 2015 to conclude that "humans function as an unsustainable 'super predator,' which – unless additionally constrained by managers – will continue to alter ecological and evolutionary processes globally" (*ibid.*, 858).

> Humans have diverged from other predators in behavior and influence. Geographic expansion, exploitation of naïve prey, killing technology, symbioses with dogs, and rapid population growth, among other factors, have long imposed profound impacts – including widespread extinction and restructuring of food webs and ecosystems – in terrestrial and marine systems […] [C]ontemporary humans can rapidly drive prey declines […], degrade ecosystems […], and impose evolutionary change in prey […] [T]hese are extreme outcomes that nonhuman predators seldom impose. (Darimont et al. 2015: 858)

[15] For a review of legal and illegal wolf hunting in Scandinavia, see Tønnessen 2010c.

[16] On the topic of animals in the Anthropocene, see Tønnessen, Armstrong Oma & Rattasepp (eds.) 2016.

4.1. Conflicts of interest: Whose prey?

In historical times, people occasionally fell prey to predators, but in modern, economically developed countries, this hardly happens anymore. In some regions of India, however, depredation events involving wolves have happened quite recently, and every year a few people are killed by tigers (though elephants, for example, may be just as dangerous in terms of the number of people killed per year). Even so, Indian conservationists tend to argue that even man-eating tigers should not be culled.

Apart from such exceptions in the bigger picture, human hostility toward large predators is more often motivated by conflicts of interests related to prey animals. This can concern either animals in our care, typically livestock, or animals that are hunted both by large predators and by humans – for instance, ungulates in Europe. A striking finding in the study of Darimont *et al.* (2015: 858) is that globally, human "hunters exploited large carnivores at 3.7 times the rate that they killed herbivores". This is quite remarkable, given that herbivores constitute natural prey for humans, whereas large predators generally do not. Even though large carnivores are in this sense overexploited by humans to a larger degree than herbivores are, there is not much doubt that competition for prey animals is an important motivating factor explaining the enmity between humans and other large predators. Darimont *et al.* (2015: 858) refer to "competitive reasons [intraguild predation]". They further note (*ibid.*) that "agri- and aquaculture, as well as an ever-increasing taxonomic and geographic niche, leave an enormous and rapidly growing human population demographically decoupled from dwindling prey".

In their study of anthropogenic influence on lynx behaviour, Bouyer *et al.* (2015: 291) observe that

> [o]f all the species negatively affected by human developments and activities, large carnivores are generally considered as particularly sensitive because of their large spatial requirements and low densities […] These spatial requirements imply that large carnivore conservation, especially in crowded areas like some parts of Western Europe, require their integration into human-dominated landscapes because protected areas are too small.

In response to the presence of humans or of human constructions etc., predators may change habitat use. "However, in Europe, the ungulates that are the main prey of large carnivores often occur at higher densities close to artificial feeding sites and human modified landscapes […] This distribution of prey can induce potential trade-offs between risk avoidance and prey access" (Bouyer *et al.* 2015: 291–292). The study was focused on southeastern Norway, which includes some of the most populated areas in Norway (*ibid.*, 292). It shows that lynx, whose diet in southern Norway is dominated by roe dear and other ungulates (*ibid.*, 293), "seem to select rural areas of medium to high human modification and avoid unmodified

semi-natural habitats" (*ibid*., 294), whether they want to rest, kill, or move. In other words, they get quite close to humans. The lynx studied preferred both resting sites and kill-sites located in rugged areas (*ibid*.). "Lynx clearly select for, and move, in rugged areas for all the different classes of human habitat modification" (*ibid*.). This suggests that lynx try to combine getting close to potential prey in typically human-modified areas with hiding from humans. In support of this hypothesis, the authors point out that lynx tended to move at low elevations "in forested areas and in rural landscapes with low human modification, but […] moved at higher elevation when they were in rural landscapes with medium to high human modification" (*ibid*.). In conclusion, Bouyer *et al*. (2015: 298) claim that "the presence of people, roads and fields are not automatically an obstacle to lynx presence as long as there is some cover (forest and terrain) and prey". This makes lynx conservation feasible "across vast areas of the European landscape" on a continent which is largely "a mosaic of small forest patches and agricultural habitats crisscrossed by roads and with high human densities" (*ibid*.). Similar arguments have been made about the other large mammalian predators.

5. Long-term vs. short-term goals for large predator management[17]

It is conceivable that an animal can die by the hand of man and still have lived a life as a wild animal. Nevertheless, considerable anthropogenic mortality is no doubt a sign of a level of human intervention that conservation biology should aim to overcome. In the short-term, some measures might be warranted for emergency reasons, as it were, that are not desirable in the long-term.[18]

What should the long-term goals of the management of large predators be? In my opinion, conservation biology should aim to restore the *independent viability* of threatened or marginalised populations of wild carnivores. Viability in general concerns the population's resilience and vigor – its chances to continue to exist in the long run. Viability on the population and species level is supported by individual animals' pursuit of survival and well-being, which is dependent on suitable ecological conditions as well as on individual ingenuity. The qualifier 'independent' in 'independent viability' refers to the normative idea that a large predator population's viability should not depend on neverending human management. If a wild animal is viable only given continued human management, then it is not truly viable. In this perspective, it is very important, crucial actually, that contemporary management measures should support the

[17] Parts of this section is based on Tønnessen (2013: 92–94).

[18] Emergency measures can possibly be required, such as when a species is close to extinction or when one animal species is threatened due to competition with another animal species whose presence has been significantly favoured by anthropogenic environmental change.

long-term, independent viability of predators and not result in dependence on continued human conservation actions.

An implication of this stand on conservation practices is that in the long-term, large predator management as we know it today should seek to make itself redundant. To many wildlife managers, such a claim might appear to be surprising, if not outright shocking. In our current ecological and societal situation, an end to extensive large predator management is not in sight. How could we do without it? And, one might add, has there not *always* been something akin to large predator management in practically all human societies throughout the ages?

An end to today's often invasive and lethal large predator management is only feasible given deep societal changes with regard to how we relate to predators and other animals. In such a new culture, humankind will no longer assume a monopoly on prey or on the use of land and resources. The scenario presupposes that large predators have, by that point, achieved independent viability, and this in turn presupposes that poaching has been reduced to a minimum. It further presupposes that humans and large predators can find ways to coexist without extensive damage to human interests, such as livestock. People will come to look at a distant relationship with large predators as natural, desirable, or at least tolerable.

From a conservation standpoint, it appears to be intuitively true that the more we do in a large predator's favour, the better. However, this is not necessarily true. The long-term goal for large predator management should be that human society seen as a whole neither works particularly *for* nor *against* large predators. This can only be achieved by marginalising the human influence on the living conditions and thus on the umwelten of large predators. Thus, instead of seeking to *balance* harmful human influence on large predator ecology (e.g. illegal hunting) with beneficial human influence (e.g. legal hunting, presumably), we should, in the long run, seek to *maximise the semiotic autonomy of large predators*. This is a sound aim because, by nature, any animal lives and survives by use of its own capacities, including their semiotic capabilities, and because the currently excessive anthropogenic influence on wildlife radically disturbs semiotic autonomy. The semiotic autonomy of animals presupposes relatively intact ecosystems and a minimum of human disturbances. Importantly, an end to large predator management as we know it today in effect presupposes that today's lethal management measures, and those management measures that are invasive, are replaced by non-lethal and non-invasive or less invasive management measures.[19] In the case of Scandinavian wolves, tracking of wolves on snow and collection of excrement etc. for DNA analysis (cf. Wabakken *et al*. 2012: 15–16; cf. also Bischof *et al*. 2015), and other non-invasive observations

[19] In a *wild carnivore management Utopia*, the carnivore management *could* be carried out in a more informal way and might not have to rely on law-based public predator management. The substance that has to change – and that is decisive no matter what the law and official regulations say – consists of the norms, perceptions and actions of individual human stakeholders.

could still be carried out even in this *wild carnivore Utopia* in order to keep an eye on population trends and so on.

At the seminar of the Scandinavian Wolf Project (SKANDULV) in the autumn of 2010, I presented thoughts such as these on the long-term goals of wolf management for an audience consisting of researchers and wildlife managers (for information on and from SKANDULV, see SKANDULV). The opposition to my remarks on this point was quite massive. This might not come as any surprise, given that the researchers and wildlife managers present had no economic self-interest in making themselves redundant. Several in the audience did not share my vision of a world with minimal intervention in the lives of wolves; this may be because they did not see it as feasible or because they did not see it as desirable. But I sincerely think this is the direction in which we should go. In the discussion, counterarguments were not fully articulated, but some were indicated by exclamations such as "If we stop hunting wolves, then what is next? Will we stop hunting moose too?" This was clearly intended as an absurd question, a self-defeating argument, for an end to moose hunting appeared to be entirely inconceivable. Apparently a wholly nonviolent or vegetarian humanity is just as utopian an idea as, within the framework of new heavens and a new earth, vegetarian predators.

This vision of a world where lethal large predator management is ultimately redundant implies that anthropogenic mortality should be minimised.[20] This would by and large be in line with the proposals of Darimont *et al.* (2015: 859), who suggest "[a]ligning exploitation rates on adults [within large predators] with those of competing predators". As they observe, "aggressive reductions in exploitation are required to mimic nonhuman predators, which represent long-term models of sustainability".

This particular benchmark – minimising anthropogenic mortality in large predators – is arguably suitable both in the long-term and in the short-term. In the long-term, the goal should be to achieve an anthropogenic mortality as close to zero as possible. In the short-term, anthropogenic mortality – calculated and read as the share of all large predator deaths caused by humans – can serve as a telling measure of how far we are from establishing a specific carnivore species' independent viability. The higher the anthropogenic mortality, the further away from this goal are we.[21] And conversely, the lower the anthropogenic mortality,

[20] This concerns both legal kills (including management-related culling, etc.) and illegal kills (poaching and the like).

[21] It should be noted that I propose (1) *promoting independent viability* and (2) *preserving (bio-)semiotic autonomy* as management goals, and (I) *marginalising human influence on the umwelten of large predators* and (II) *minimising anthropogenic mortality* as important measures to reach those goals. However, given my Gandhian inclinations, I must admit that for me *not killing* large predators (II) is something that has intrinsic value. In other words, I regard refraining from killing – nonviolence – as an activity that has value in itself. This is telling of my values. But as the arguments of Darimont *et al.* (2015) show, it is fully possible to favour minimising anthropogenic mortality in large predators on ecological grounds, without sharing my nonviolent values.

the further we have likely come towards accomplishing independent viability. Intermediate goals can of course be set, as long as they take us in the right direction. In the context of Scandinavian wolf management, an intermediate goal could be that a few years from now, less than half of all wild wolves should die as a direct result of human actions – in other words, that at least half of all wolves will die of natural causes. This would at least change the balance in the developing state of wolf mortality from being predominantly anthropogenic to being equally anthropogenic and natural (i.e., human agency would "only" equal natural forces, instead of dominating over them). Lower anthropogenic mortality would enable many Scandinavian wolves to take control over their own lives, as it were, and give more room for natural migration, courtship, and maintenance and establishment of social relations and wolf territories.[22] But even accomplishing this intermediate goal will require considerable efforts, given that today only one in five wolves, as we have seen, experience a natural death, according to Olsen (2003).

In semiotic terms, the goal of minimising anthropogenic mortality for wild carnivores implies that the functional cycle of killing should be made as insignificant as possible in the bigger picture. Given the extent of today's lethal large predator management, this would in most cases amount to a fundamental *umwelt transition* (see Tønnessen 2009a) in how we relate to wild carnivores. This would be reflected in changes in our human umwelt with regard to how large predators are perceived and treated, as well as in the umwelten of wild carnivores. Overall, humans would likely over time (in the really long run) become less prominent umwelt objects in large predator umwelten, noticeably as enemies. The implied presuppositions would also entail changes in the relationships between large predators and several animals in human care, particularly grazing livestock (which would, again, be reflected in umwelt transitions in the case of many animals), while basic predator-prey relations in the wild were safeguarded.

Acknowledgments

This work has been carried out thanks to the support of the research project Animals in Changing Environments: Cultural Mediation and Semiotic Analysis (EEA Norway Grants/Norway Financial Mechanism 2009–2014 under project contract no. EMP151). I would like to thank Bjarne Braastad (NMBU) for providing literature references related to domestication, and Timo Maran for valuable feedback on earlier drafts of this chapter.

[22] This would require greater flexibility from humans. But since wolves are sensitive to the presence of humans, human settlements and activities limit the activities of wolves, and several non-lethal management measures could be used to influence wolf activities in ways that better respect the wolf's semiotic autonomy.

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Semiotics in animal socialisation with humans

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The Five Freedoms[1] that represent the basic needs of all captive animals could be interpreted very differently depending on the cultural and institutional backgrounds of the people involved. Some of the many scientists who have drawn attention to this problem are animal behaviourists Geoff Hosey, Vicky Melfi and Sheila Pankhurst. In their book "*Zoo Animals: Behaviour, Management and Welfare*" (2009), they offer a more objective and specific approach to these Five Freedoms. In addition to pointing out the importance of the animals' ability to thrive in captivity and viewing the behaviours of the animals' wild conspecifics as a template for good welfare (Hosey *et al*. 2009: 218), they ask for more empathy from animal caretakers. Namely, they emphasise considering animals' subjective experiences and emotions, and "drawing analogies from ourselves about the needs and abilities of other animals" (Hosey *et al*. 2009: 218). This shift of thoughts, conjointly being suggested and supported by many scientists, has brought up a brainstorm on new ideas to improve animal welfare from the minimum standards to the highest possible levels. These ideas vary from new environmental enrichment methods and training plans to enclosure designs and husbandry routines. One of the rather novel methods of improving animal welfare is the socialisation of captive animals with humans. This process certainly requires focusing on the individual animal (as a subject), considering its emotions, relationships, and consciousness – its subjective lifeworld (Umwelt).

There exist several types of captive animals, such as pets, livestock, laboratory and research animals, working and performing animals, circus animals, and residents of zoos and aquariums. Although proper socialisation with humans is important for the welfare of all captive animals (including dogs, horses or cattle), it is much more difficult and crucial with captive wild animals. Namely, domesticated animals have gone through a long process of selective breeding towards being suitable for living with humans and are, therefore, genetically prone to be more accepting and less fearful of humans. This means they are genetically

[1] The Five Freedoms stated by the British government Farm Animal Welfare Advisory Committee in 2012 (originally announced in 1965) are: Freedom from Thirst, Hunger and Malnutrition; Freedom from Discomfort; Freedom from Pain, Injury, and Disease; Freedom to Express Natural Behaviours; and Freedom from Fear and Distress. Reference: Farm Animal Welfare Council 2012. Five freedoms. [WWW] http://www.fawc.org.uk/freedoms.htm (16.04.2014).

predisposed to be easier to socialise (Goodmann 2015).[2] Also domestic animals usually receive some amount of socialisation as part of their upbringing (*ibid.*), while the proper socialisation of captive wild animals is quite exceptional. For this reason, the following chapter concentrates on the socialisation of captive wild animals (taking the zoo as an example), although the principles of the process would be similar with domesticated animals.

The goal of socialisation of an *ex situ* wild animal with humans is to reduce the animal's fear of humans *as much as possible* and thus make the animal more comfortable living in a human environment. While fear of humans is a crucial survival strategy in the wild, it is not relevant (and definitely not in the animal's best interest) in captivity. An animal that is not suffering[3] from fear exhibits a much wider and more natural range of behaviours compared to an unsocialised animal whose whole behavioural repertoire is influenced by fear. Considering the above-described requirements, socialisation has a doubly beneficial effect on improving animal welfare as it decreases the animal's fear and enables it to exhibit a wide range of natural behaviours (with the exception of fear of humans).

Although fear is to some extent learned, animals' fear of humans has been proven to be species-specific (Carlstead 2009: 600). It depends on the essence of the species' history of interactions with humans as well as its ability to recognise man as an ecosystem's top predator. Therefore, it is most important to socialise animal species that have a genetically induced high fear level of humans. These would include large carnivores (e.g. wolves and big cats) but also other species (e.g. foxes), whom people have been extensively hunting for centuries, in many cases almost to extinction. These animals' predecessors who feared people had a better chance of surviving and were thus selected. Over thousands of generations, these species have developed a genetically forwarded fear of humans, which makes it very difficult for them to adapt to life in captivity. These animals would be suffering from the stress of being surrounded by visitors[4] and handled

[2] Goodmann, Patricia A. 2015. Why Hand Raise Captive Wolves? [WWW] http://www.everythingwolf.com/news/readarticle.aspx?article=38 (31.07.2015).

[3] Not just any negative subjective state means the animal is suffering. British animal behaviourist Christopher John Barnard has distinguished suffering as "a causal mechanism that triggers adaptive aversive responses in the animal" (Barnard 2004: 213). He has also explained that negative functional consequences for the individual can result in one of two ways: from "adaptive self-expenditure, where negative subjective states reflect adaptive cost-gauging" (for example fatigue while foraging or pain indicating an injury) or from "non-adaptive self-expenditure" (for example hunting fruitlessly in an inappropriate environment or mounting an ineffective immune response against a novel parasite) (Barnard 2004: 214). It is important to comprehend that only the non-adaptive self-expenditure qualifies as suffering (*ibid.*), whereas short-time stress could even be good for the animal.

[4] The widely held view according to which zoo animals habituate with the public and no longer respond to their presence is now abandoned (Hosey *et al.* 2009: 479). Studies have shown that the effect of zoo visitors on animals is generally negative, resulting in displays of behaviour that are associated with stress response, such as stereotypies, increased intraspecific and interspecific aggression, increased activity, and, sometimes, decreased affiliative behaviours (Hosey *et al.* 2009: 475–476).

by caretakers. Also they would be too fearful to participate in the majority of enrichment programs (or they would rather gain negative experiences from it). The problem would be even more severe if the species is known for being neophobic (e.g. wolves, foxes). Such cases usually result in the animals' stress response, stereotypical behaviour, increased aggression towards conspecifics and people (Hosey *et al.* 2009: 475–476), extensive hiding behaviours, (often self-destructive) attempts to escape, etc. Not only does it reflect poor welfare, but this scenario is also not at all in accordance with the accredited zoo's purpose of educating people about the animals. Even more, it does not help with research on the species' natural behaviour nor with conservation aims, considering that knowledge of the species' natural behaviour is the foundation of most conservation efforts. Therefore, finding ways to make visitors (more precisely, people in general) less frightening and more enriching for animals is gradually becoming more relevant in zoo studies (Hosey *et al.* 2009: 479).

Although the idea of socialisation – that is, the understanding of the necessity to reduce the captive animal's fear of humans – has been well-known for a long time (Hediger 1950: 19), the concept of socialisation as an animal welfare program is relatively young.[5] In the scientific literature of animal studies, the existing definitions of socialisation are remarkably ambivalent (often contradictory) and insufficient. For example, Hosey, Melfi and Pankhurst have defined socialisation as "the process, where animals routinely interact with people and become familiar with them, leading to changes in the human–animal relationship" (Hosey *et al.* 2009: 232). An American canine behaviourist, Barbara Handelman, defines the socialisation of dogs as "a systematic process of exposing a pup to a wide range of dogs, people, and places. There is a very narrow window for proper socialisation" (Handelman 2008: 243). The scientists of Wolf Park (Indiana, USA), where wolves, coyotes and foxes have been socialised with humans for over 40 years, define socialisation in various ways, such as "the process of making an animal more suitable to live with humans" (Addams, Miller 2007: 70) or "to rear, or interact with it in such a way that it can use its repertoire of social signals with

[5] To the best of my knowledge, one of the first scholars studying the socialisation of captive wild animals with humans explicitly for animal welfare purposes were the ethologists Dr. Erich Klinghammer and Pat Goodmann from Wolf Park (Indiana), who started their research in the socialisation of gray wolves in 1972. Previously, socialisation of some kind had been practiced by some zoos and sometimes even scientifically studied but usually for different reasons than improving animal welfare. For example, ethologist Konrad Lorenz studied the process of imprinting and juvenile development. Biologist Heini Hediger talked about the necessity of reducing zoo animals' fear of humans (to improve animal welfare) but not quite in the methods or terms of socialisation described in this article. As far as I am concerned, the only scholars who socialised animals for their research before Wolf Park were ethologist Erik Zimen, who socialised wolves, and ethologist Irenäus Eibl-Eibesfeldt, who socialised wolverines. In his book *The Wolf, a Species in Danger* (1981), Erik Zimen referred to some benefits of socialisation to animal welfare.

other animals [*humans*]"[6] (Goodmann 2011).[7] In my opinion, although being true, none of the mentioned definitions adequately and sufficiently represent the true essence of socialisation – reduction of the animal's fear of humans by changing the perception of humans in the animal's umwelt. Nor do they provide understanding of the relations of socialisation and other types of human–animal relationships occurring in the zoo.

Socialisation is truly a matter of navigating in the fields of communication, interpretation, and relationships. As such, it is essentially a semiotic problem. In this chapter, I will introduce the semiotic mechanisms and methods of socialisation and, by doing that, attempt to clarify the definition of socialisation and its position in the discourse of human–animal relationships. Besides scientific literature, the chapter is based on my master's thesis about the case-study of socialising red foxes (Kiiroja 2014), the knowledge I gained from working with socialised wolves during my internship at Wolf Park, my experience in socialising a litter of European grey wolves in Germany, and, above all, the priceless wisdom of Runar Næss (Animal Zoolution, Norway) and Pat Goodmann (Wolf Park, USA), experts in wolf behaviour and socialisation.

1. The semiotic ontology of socialisation of captive wild animals with humans

As previously mentioned, an individual-oriented approach to the welfare of zoo animals requires comprehension of the animal's umwelt. Considering the animal's umwelt is, in fact, an implicit task already in animal behaviour studies (although it has not always been understood as such). American biopsychologist Gordon M. Burghardt has even suggested the attempt to comprehend an organism's private experience (including its subjective perceptual world, mental states, and subjective responses) to be the fifth aim of ethology[8] (Burghardt 1997: 276). When it comes to the process of the socialisation of captive wild animals with humans, umwelt consideration is inevitable and, indeed, of the highest importance.

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6 Although animals can be socialised to many species other than their own, this chapter concentrates on socialisation with humans.

7 Goodmann, Patricia A. 2011. Explain the difference between an imprinted or socialised animal, or are they the same thing? [WWW] https://theiwrc.org/archives/1647 (31.07.2015).

8 The fifth aim of ethology refers to the four guiding questions about animal behaviour proclaimed by the honoured ethologist Niko Tinbergen in 1963: what is the function of the behaviour, what is the cause of the behaviour, what is the ontogeny of the behaviour, and what is the phylogeny of the behaviour (Tinbergen 1963: 410–433).

Umwelt, as a concept first developed by Baltic-German biologist and semiotician Jakob von Uexküll, could be explained as the totality of an organism's perceptual and effector realms, i.e. the sum of all sign processes in which the organism participates as an interpreter (Uexküll 1982: 66–67). To put it simply, an umwelt is the semiotic world of an organism (Kull, Torop 2003: 414). Uexküll explained that through every perception act, "the neutral object is transformed into a meaning-carrier, the meaning of which is imprinted upon it by a subject" (Uexküll 1982: 62). Not only does this process depend on the animal's sense organs, but also on the individual's past and current personal experiences. Therefore, animals obtain a very selective and subjective view of the world around them.

How does the process of interpretation work? It could be explained with the mechanism of a functional circle, which basically means that every perception begins with a perceptual cue and ends by producing an effector cue on that meaning-carrier (Uexküll 1982: 66). While Uexküll claimed the most important general functional circles in most animals' umwelten to be the circles of physical medium (i.e. the surrounding environment), food, enemy, and sex (Uexküll 1982: 67), a Norwegian philosopher and biosemiotician Morten Tønnessen adjusted them to physical medium, food/resources, enemy and *partner* (Tønnessen 2009: 54; Fig.1). This adjustment is important when taking into consideration the various kinds of social relationships, besides the reproductive ones, that function as partnerships in the animal's umwelt.

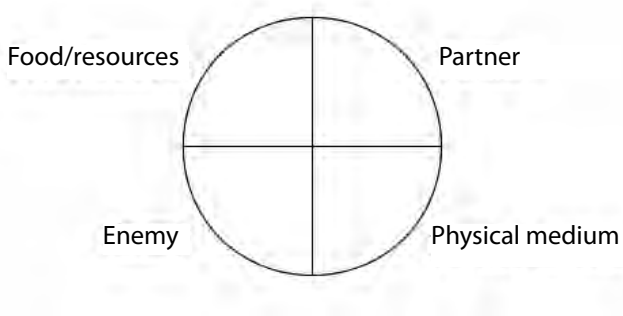

Figure 1. Phenomenal fields (Tønnessen 2011: 44)

Tønnessen has brought out the concept of ontological niche, inspired by Danish biosemiotician Jesper Hoffmeyer's theory of semiotic niche. While Hoffmeyer's semiotic niche involves all the interpretive challenges offered for the animal by its ecological niche (Hoffmeyer 2008: 13), Tønnessen's ontological niche involves the set of the animal's active relationships at the current moment of the history of nature (Tønnessen 2009: 54). The ontological niche, therefore, determines the area in the phenomenal world occupied by the animal. Tønnessen has depicted

the ontological niche as phenomenal fields, where one animal's phenomenal fields overlap with those of the other animal with whom it is in interaction (Tønnessen 2009: 54). Such an ontological map sufficiently describes the various possibilities of human–animal relationships (as well as animal-animal relationships).

Adapting this theory helps us understand the essence of socialisation. An animal that needs to be socialised is fearful of humans to begin with – man occupies the phenomenal field of enemy in this animal's umwelt. In order to properly socialise the animal, its umwelt needs to be reconstructed by shifting the position of man from the phenomenal field of enemy to that of partner (Fig. 1). However, in practice, this reconstruction is not that simple. It seems to me that there exist many transition-phases, such as the "rather negative significance", "neutral significance", "rather positive significance" of people, before people in general obtain a meaning-carrier of a partner in the animal's umwelt. To make it even more complicated, it so happens that some people, who have a strong positive relationship with the animal, are considered as partners, whereas unfamiliar people could still, by default, carry a meaning of an enemy.

The degree to which the animals are socialised is a matter of the zoo's priorities. There exist three basic levels of socialisation, although only two of them should be recommended in zoos when high animal welfare is a goal. First, an animal could be socialised to one person only. It will still have a relatively high fear level of other keepers as well as of visitors, which makes the beneficial effect of socialisation rather low. Additionally, the animal could suffer under severe stress should the one caretaker quit working with the animal. A second and better way (animal welfare wise) would be socialising the animal to the zoo staff. In this case, the animal would have positive relationships with the zoo workers, but it could still be fearful of visitors. The third way would be general socialisation. Here, the animal would be socialised to all people. This would require multiple positive relationships with the zoo staff as well as actively including positive interactions with visitors in the process of socialisation so that, eventually, visitors (at least the ones coming into the enclosure) would carry a positive significance for the animal and be perceived as enriching (Næss, personal conversation, 30.03.2012).

At this point, it becomes indispensable to explain the difference between relationships and significance. Namely, a positive significance of a human for the animal does not automatically mean that there exists a positive human–animal relationship (or any relationship at all) between them. A relationship requires two individuals to have a "history of interactions between them that lead to a greater predictability about the outcome of future interactions; in other words, they get to know what each other is likely to do" (Hosey *et al*. 2009: 483). Deriving from that definition, in this chapter the development of human–animal relationships is considered possible between the animal and people who regularly spend time with it. A visitor-animal relationship as such does not exist (apart from the exceptional cases where the visitor frequently and regularly visits a zoo animal

and interacts with it). A visitor can have positive or negative significance for the animal according to how the animal perceives it, but (s)he does not have a relationship with the animal. However, it is important to understand that the relationships that the animal has with its caretakers heavily influence the animal's perception of zoo visitors as well as its experience of interaction with them (Hosey *et al.* 2009: 487).

With this in mind, it is comprehensible that the third way of socialisation – that of general socialisation – is the most favourable for umwelt-reconstruction. The first two methods change the meaning-carriers of the people with whom the animal has a positive relationship to that of partner; however, the general public may still remain in the phenomenal field of enemy, and the animal may still be stressed by unfamiliar people. This is so because, in such cases, the animal's socialisation with humans only includes the people who look and behave a certain way (the way of the familiar keeper or the zoo staff). In general socialisation, the umwelt-reconstruction is much more encompassing as positive partnership-based relationships, positive visitor interactions, and proper desensitization (which will be discussed later in this chapter) enable the animal to perceive even unfamiliar people on a scale from neutral to positive (Fig. 2). Only then can one say that humans (in general) occupy the phenomenal field of partner rather than of enemy in the individual animal's umwelt. This is the level of umwelt-reconstruction, set as a goal for proper socialisation in the context of this chapter.

Figure 2. Generally socialised zoo wolves relaxing with a handler in front of visitors in a 10000 m^2 enclosure.

2. Human–animal relationships involved in socialisation from the perspective of umwelt theory

The previous analysis revealed the importance of umwelt consideration in order to properly socialise an animal. The perspective from umwelt theory could also offer opportunities for much-needed understanding of the differences between human–animal relationships related to or involved in socialisation methods such as imprinting, taming and habituation.

Let us start with the process of imprinting. Imprinting, especially human-imprinting (i.e. the phenomenon of animals imprinting on humans), is quite a perplexing concept. In the scientific literature, imprinting is usually defined as a process of learning about one's species identity, gender identity, or relatedness to other individuals during a young animal's "critical period"[9] when it is primed to bond easily with any living thing (Addams, Miller 2007: 70; Hosey *et al.* 2009: 79–80). However, it is known that, in some species, food and habitat preferences may also be developed during this very young age (Goodmann 2011). Since in this chapter I am aiming to differentiate between different types of human–animal relationships, I will concentrate on the bonding and relationship-building element of imprinting.

There are two important nuances of this sophisticated process that I would like to emphasise: the possibility of imprinting on inanimate objects, and the sexual and social elements of imprinting. There are examples of animals imprinting on lifeless objects in case no living organisms are present during the "critical period" of imprinting (Ramul 1972: 99–100). It is a well-known fact that Konrad Lorenz had some of his geese imprinted on various inanimate objects, such as a lightbulb or a pair of gumboots. Chinese rice farmers have a centuries-old tradition of imprinting ducks on a special stick, which they later use to bring the ducks to the rice fields in order to restrain the snail population.[10] The fact that animals can imprint even on lifeless objects illustrates the strength of the bond of imprinting – something that becomes very important to comprehend in socialisation.

Namely, proper socialisation (changing the meaning-carrier of humans in general in the animal's umwelt) requires the animal to have strong positive relationships with its caretakers. These relationships could be divided into primary (imprinted) and secondary relationships (built after the animal's "critical

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[9] The critical period is "a period of development […] during which an animal develops a familiar bond with whatever species with which it is in primary contact. Also known as '*socialisation window*'" (Addams, Miller 2007: ix). The length of the "critical period" varies between species. For example, in foxes it ends at approximately three or four weeks of age (Addams, Miller 2007: 69). In wolves, the "critical period" is known to end at about six weeks of age (Næss, personal conversation, 25.06.2013).

[10] Public Broadcasting Service 2012. My Life as a Turkey: Who's Your Mama? The Science of Imprinting. [WWW] http://www.pbs.org/wnet/nature/my-life-as-a-turkey-whos-your-mama-the-science-of-imprinting/7367/ (31.01.2015).

period") (Næss, personal conversation, 30.03.2012). Without primary relationships, the animals' bond with humans will be significantly weaker, and the animals will never be as fearless of humans and able to enjoy their man-made surroundings in as relaxed, stress-free manner (Addams, Miller 2007: 70). The process of imprinting provides the necessary strong foundation for changing man's position in the phenomenal fields of the animal's umwelt.

This line of thought brings us to the second important nuance of imprinting. Namely, it is a widely held view that being human-imprinted is not favourable to animal welfare since it results in animals who do not possess proper social skills to communicate with their own kind and are not interested in interacting with their conspecifics. Instead, human-imprinted animals are constantly looking for attention from people and direct all their behaviour (including sexual and socially challenging behaviour) at humans, making them both miserable and not suitable for the educational display of natural species-specific behaviour (Næss, personal conversation, 30.03.2012). How does this aspect fit in with socialisation? Here I would like to suggest recognising two different elements in the process of imprinting: sexual, i.e. imprinting the animal's species identity and future mate preferences as was originally suggested by Konrad Lorenz (Goodmann 2011), and social imprinting, i.e. accepting another individual as being a natural part of its social group. All animals have an innate tendency to imprint on their biological parents or somebody who most resembles their biological parents (Addams, Miller 2007: 70) (among the organisms or objects that are present during the "critical period" of imprinting). This explains the reason why animals have to be hand-raised (starting during the "critical period", before the onset of fear) in order to be properly socialised with humans.[11] It is not enough to visit the baby animals regularly while letting them be raised by their socialised biological mother: this method (attempted by Wolf Park) will most likely produce animals who "will show some shortened flight distance[12] from humans as they mature

[11] It is beyond the scope of this article to discuss the advantages and disadvantages of removing baby animals from their mother. However, it has to be explained that people's concern about the welfare of the mother is highly anthropomorphistic. For example, practical experiences with wolves reveal that the mother animal returns to its normal behaviour within an average of three days after its pups have been pulled, and this has been related to the time it takes for the mother's milk to dry up (Goodmann, personal conversation, 14.01.2015; Næss, personal conversation, 25.06.2013). Thus I would conclude that the lifelong advantages of baby animals being socialised with humans outweigh the short-period stress of the mother animal whose offspring have been removed. However, I acknowledge that the situation would be different with species known for their extraordinarily strong mother-offspring bond (e.g. elephants and chimpanzees).

[12] The flight distance is a characteristic escape reaction – specific for sex, age, enemy, and surroundings – that the animal shows when the enemy approaches within a certain distance (Hediger 1950: 19). That means flight distance is the distance that, when crossed by the enemy, makes the animal flee. If the possibility to flee is eliminated, the animal's subsequent response is defensive aggression (Hediger 1968: 123–124).

but they will not show much of their social repertoire to us [*people*] and they will not solicit many affiliative interactions; rather, they tend to stay out of reach" (Goodmann 2011). Such animals would also be significantly more fearful of humans when compared to animals that were hand-raised (Næss, personal conversation, 30.03.2012).

But how to avoid sexual imprinting on humans as foster parents during hand-raising? This is why it is necessary to socialise multiple young animals together – if an animal has a choice, it will imprint sexually on its own species or the species who most resembles their own species (Addams, Miller 2007: 70; Næss, personal conversation, 30.03.2012). It has a genetically induced tendency to prefer its own species to humans (or any other species) if given a chance. When hand-raising young animals together with their littermates, they will learn their species identity as well as adequate species-specific behavioural and social skills[13] by sexually imprinting on their littermates. Due to being exposed to humans as foster parents, the animals will imprint on humans socially, considering these certain people as members of their social groups. The validity of this differentiation is supported by practical experience (both my own and that of experienced animal socialisation experts), according to which such a socialisation method results in animals who are able to clearly discriminate between conspecifics and extraspecifics (humans) and who have proper communication skills for interacting with both of them (Næss, personal conversation, 30.03.2012).

In terms of umwelt processes, during the "critical period" of imprinting, the animal learns about the functional circles and phenomenal fields in its umwelt. The phenomenal fields of enemy and partner will be established. (Depending on the species, for example in wolves [Næss, personal conversation, 25.06.2013], the functional circle of the physical medium – the animal's habitat preferences – and the functional circle of resources – e.g. the animal's food preferences – will also be established in that early period of life.) One may conclude that to have humans obtain a meaning-carrier of only a social partner and the members of the animal's own species obtain a meaning-carrier of a sexual (and social) partner in the animal's umwelt, it is essential to socialise multiple young animals together (or at least have another compatible animal included in the socialisation process).

Another way to build a human–animal relationship that is partly involved in socialisation is taming. It is easy to confuse tame animals with socialised animals, and it is also often unclear what advantages socialisation has over taming. One fact unanimously agreed upon among scholars is that taming is the active (i.e.

[13] Except for the few behavioural and social skills that require being taught by parents or other adult members of their species, for example hunting skills or interacting with adult animals. Successful hunting is not a relevant skill in a captive environment. Communication skills with adult animals would be necessary if the young animals are to be introduced to the rest of the pack after their hand-raising period. In such cases, frequent but short visits of socialised adult animals are included in the process of socialisation (Næss, personal conversation, 25.06.2013).

intentionally conducted by humans) reduction of an animal's flight distance from humans to zero (Addams, Miller 2007: 70; Handelman 2008: 266; Hediger 1950: 156; Sebeok 1990c: 125). Therefore, taming is innately involved in the process of socialisation. However, taming *per se* does not determine the methods of husbandry and, hence, the animal's fearfulness of humans or whether the human–animal relationship is positive or negative. An animal could be tamed by using aversive methods (such as punishment, dominance, etc.) so that a negative human–animal relationship will be developed, despite the animal's zero flight distance from humans (Næss, personal conversation, 25.06.2013). Excellent examples of such cases would be circus animals (elephants, big cats, and most wild animals) who usually do not have a positive partnership-based relationship with their trainer but a rather negative and fear-based one (Christian 2015[14]; Pryor 1999). It is clear that animals tamed in such ways have poor welfare and are more likely a danger to their caretakers (Næss, personal conversation, 25.06.2013; Pryor 1999).

Additionally, an animal could be tamed at any age (Addams, Miller 2007: 70–71; Pryor 1999), which means that taming does not necessarily involve the development of a primary human–animal relationship – a relationship which, as explained before, is critically important for changing the meaning-carrier of humans in general in the animal's umwelt. On the other hand, taming an animal by positive interactions (such as social play and grooming, positive reinforcement training, etc.) contributes to establishing positive human–animal relationships. Hence, taming via positive methods is always an essential part of socialisation.

Habituation is yet another process partly involved in socialisation but often confused with it. In my opinion, the most adequate definition of habituation as a learning process is "the loss of an animal's fear response to people [*or to any environmental element that can elicit fear*] arising from frequent non-consequential encounters" (Smith, Stahler 2003: 5). The most important difference between socialisation and habituation is that the latter is, in its essence, an *absence* of a substantial human–animal relationship. There is no history of interactions between a man and an animal that would lead to the development of a social relationship (as relationships are defined in this chapter). Neither does it involve changing the "enemy" meaning-carrier of man into that of 'partner' in the animal's umwelt. Habituation simply results in man's *neutral to positive significance* for the animal in a certain situation. The phenomenon of habituation could occur even with animals living in the wild (who share their habitat with humans). Let's take the example of raccoon dogs who eat at human garbage sites. These raccoon dogs have learned about human habits of leaving food scraps behind and have been reinforced (by food) to lose the fear response to humans in this situation. However, there is no relationship between an individual human and a raccoon dog.

[14] Christian, Paul 2015. The Barbaric Tradition of 'Breaking the Spirit' of Elephants for Their Use in the Tourism Industry. [WWW] http://www.onegreenplanet.org/animalsandnature/breaking-the-spirit-of-elephants-for-use-in-the-tourism-industry/ (31.07.2015).

It is important to understand that habituation is not always a favourable scenario either for humans or animals. Wild animals need a healthy fear and flight distance from humans; it is a valuable survival mechanism. If they lose it, many species can become dangerous or pests to humans – both situations increase the risk of conflicts between the two. Apart from other problems, becoming dependent on human food, for example, can lead to animal health problems and suffering from improper nutrition, as well as from a lack of hunting or foraging skills. It may also lead to unbalanced populations and changes in the animals' important movement patterns (BC SPCA 2014).[15] With these statements, I do not suggest that culture and nature should be kept separate and that all people should move into cities. The message I wish to send is that respecting wild animals for their natural behaviour and letting them live normal lives with a healthy fear of humans contributes to a life in harmony with other species much better than habituation does.

In a captive environment, some animals are habituated to humans to some degree and may benefit from it. However, animal species that have a strong fear of humans usually do not get habituated enough (to people) to improve their welfare. Additionally, if the goal is to be able to get in direct physical contact with the animal (for husbandry purposes), habituation is usually not the best nor the safest situation. As mentioned before, habituation requires non-consequential (i.e. non-changing) encounters. Once an encounter with people has a negative consequence for the animal (which could easily happen in the dynamic zoo environment, even during indirect contact), the animal will likely become stressed and experience fear of humans. Some species may exhibit aggression towards people in such situations (this could often result in an attack).

> This is the reason why [*unsocialised and only*] habituated animals are the most dangerous animals to go in with – since they have a shorter flight distance from humans than wild animals do, they are more prompt to attack should they not approve of your behaviour. What makes the situation even worse is that, since there is no social relationship involved, there will be very little communication – the animal will either flee or attack immediately. A tame animal, who has a negative relationship with people, would at least give a fair amount of warning signals first. (Næss, personal conversation, 14.05.2014).

In a zoo environment, some form of habituation is implicitly always present in the process of socialisation: a socialised animal is usually well-habituated to the visitors (strangers) outside the enclosure. Habituation to the public is the result of non-consequential exposure – the situation changes when the visitors come into the enclosure. In the case of a generally socialised animal, visitors that come into the enclosure will usually be perceived as positive. For an animal that is socialised

[15] The British Columbia Society for the Prevention of Cruelty to Animals 2014. Don't Feed the Animals. [WWW] www.spca.bc.ca/assets/documents/locations/wild-arc/teacher-resources/dont-feed-wildlife-2014.pdf (31.07.2015).

only to the zoo staff (the second way of socialisation) or to one keeper (the first described way of socialisation), visitors that come into the enclosure could then have a negative significance for the animal. I myself have been (immediately after entering the enclosure) attacked by a wolf who was well-socialised only with his keeper and habituated to the visitors behind the fence.

At this point, it has become clear that socialisation (to the level considered most favourable for animal welfare in the context of this chapter) involves the animal's social imprinting on humans, taming methods that contribute to building a positive human–animal relationship, and habituation to unfamiliar people (whereas ideally, unfamiliar people would obtain a positive significance for the socialised animal). However, it is crucial to understand that man as a meaning-carrier in a captive wild animal's umwelt has a temporal dynamic. Socialisation (as well as taming) has to be kept up for the animal's entire lifetime (Beaver 1999: 140; Hediger 1950: 156). Also, neither of the previously described processes result in genetic changes in the animal (i.e. they do not result in domestication) and have to be repeated for the animal's offspring (Addams, Miller 2007: 70). Domestication is the selective breeding over the animals' generations, aimed to produce offspring that are *genetically* more adjusted to living with humans (Addams, Miller 2007: 71; Barnard 2004: 265). Socialisation as well as taming may eventually result in domestication if, and only if, selective breeding is processed. A merely tame or socialised animal is genetically still a wild animal and, under certain circumstances, can have a full wild behavioural repertoire. "Being ignorant about this aspect and expecting a wild animal to act like a domesticated animal, may result in accidents causing bodily harm or even death" (Næss, personal conversation, 14.05.2014).

3. The semiotic basis of efficient human–animal communication

The described processes of building positive partnership-based human–animal relationships and changing the meaning-carrier of man in an animal's umwelt requires certain methods of human–animal interaction and animal management. These methods include various types of social interaction and enrichment, positive reinforcement training,[16] handling routines that are not stressful for

[16] In positive reinforcement training (PRT), the frequency of a desired behaviour is increased by rewarding the animal. PRT always includes a minimum amount of negative punishment, which means decreasing the undesired behaviour by removing the positive stimulus (i.e. ignoring and not rewarding the behaviour). PRT does not use negative reinforcement (i.e. increasing the desired behaviour by removing something the animal does not like, for example physical pain) or positive punishment (i.e. decreasing the frequency of an undesired behaviour by adding an aversive stimulus). (Ramirez 1999: 546–547). It is important in socialisation never to use any kind of aversive training methods (nega-

the animal, and visitor interactions. It is beyond the scope of this article to discuss the essence of each of these management methods more specifically. However, the goal of the following analysis is to explain that in order to add a positive association to the meaning-carrier of man in the animal's umwelt, one has to make sure that the animal gains *only* positive experience from all these interactions with people. (In a zoo environment, it is not quite possible to foresee all negative experiences, but the goal should be to give one's best effort to avoid them.) For that to happen, it is essential to have a profound understanding of the animal's communication skills and interpretation processes in order to enable efficient human–animal communication.

Therefore, during the process of socialisation, one always has to be aware of the components that every communication act is built upon: the sender, receiver, channel, signal, code and context (Jakobson 1976: 346). To begin with, every individual animal requires different ways of communication. There are multiple studies that prove the existence of animal personality traits and their genetic basis (Briffa, Weiss 2010; Freeman, Gosling 2010; van Oers *et al.* 2004; McDougall *et al.* 2006; Hansen, Møller 2001; Tetley, O'Hara 2012; etc.). Additionally, the ways of communication that are acceptable by the animal greatly depend on the relationship between the human and animal (sender and receiver) (Wenner 1969: 116–117). For example, an animal might enjoy a bellyrub or accept being picked up by someone with whom it has a primary relationship, while it may interpret an unfamiliar person's attempt to initiate such contact as a threat.

Being able to recognise signals[17] conveyed through different channels used by the animal is another critical skill for successful human–animal communication. Not only do some animal species use more communication channels than humans,[18] but many species also have an ability to perceive a wider range of signals through most of the communication channels (Sebeok 2001b: 24). For example, wolves are able to smell the changes of pheromone levels or hormonal balance in humans (e.g. they can smell fear or even detect human pregnancy) (Goodmann, personal conversation, 14.01.2015; Næss, personal conversation, 25.06.2013). How they interpret these smells is another question, but this fact illustrates the

tive reinforcement or positive punishment) as it evidently damages the human–animal relationship and increases the animal's fear of humans.

[17] Here it is worthwhile to explain the difference between a sign and a signal. For semioticians, a sign is basically something that stands for something else to someone in some capacity and context (Sebeok 2001a: 156). While adjusted to animal studies as the unit of communication and interpretation processes, one might consider the semioticians' 'sign' to be synonymous with the ethologist's 'display' (which differ in involving behaviour patterns) (Sebeok 1990a: 81). Signals, on the other hand, could be viewed as signs that "mechanically (naturally) or conventionally (artificially) trigger some reaction on the part of a receiver" (Sebeok 2001a: 44). For this reason, 'signal' is the key concept in animal communication.

[18] For example, there are species known to use UV-light, ultrasound, magnetic, electric, solar, lunar and other stimuli in communication (Sebeok 2001b: 24).

differences in channel-usage one has to be aware of when communicating with other species.

Additionally, the misleading idea that the communication context is totally shared is the cause of the most serious accidents in which a human is attacked by an animal (Bouissac 2010: 53). Apart from actually transmitted signs and the current situation, context involves factors such as previous experience; exterior noise; seasonal, ecological and life history factors; the presence of strangers; etc. (Barnard 2004: 165; Hediger 1968: 3; Hosey *et al.* 2009: 476). Hence, it is clear that the perception of context is highly subjective. When working with foxes, I quickly learned that their willingness to perform certain behaviours during a training session or to get in physical contact with me depended on many factors, including the time of day, their motivation,[19] or the presence of zoo visitors. Even more, it is important to take into consideration that the information of a signal and the response evoked by it may vary radically in different situations even if the physical characteristics of a signal remain unchanged (Marler 1961: 267). For example, approaching hands during the visit of a veterinarian is probably not perceived to be as pleasant by the animal as reaching hands during a regular social interaction when this would indicate social grooming.

As far as the role of codes in human–animal communication is concerned, there are three important aspects to bring to light. First, in order to make sure that the animal gains a positive experience from interacting with people, one must be constantly aware of the human signals emitted and their potential significance according to the communication codes of the animal. For example, direct eye contact, fast movements, high body postures (e.g. standing up) and wide body movements (e.g. waving hands) can be perceived as threatening by many animal species. Another example is hugging, an essentially primate behaviour, which canines tend to interpret as antagonistic (Goodmann, personal conversation, 14.01.2015).

In the second important aspect about codes lies yet another fundamental reason for why hand-raising is important in socialisation. French zoosemiotician and philosopher Dominique Lestel has explained that a relationship based on partnership has two requirements: shared codes[20] and rationality[21] between the different species (Lestel 2002: 56). It is a common understanding that a wild animal does not inherit human codes or rationality, and neither does a human

[19] "Motivation is generally thought of as some kind of internal process that influences the likelihood of whether or not the animal will do the behaviour" (Hosey *et al.* 2009: 85).

[20] "A code is a transformation, or a set of rules, whereby messages are converted from one representation to another; an animal either inherits or learns its code, or both" (Sebeok 1990b: 92–93).

[21] "The rationality of the actors we are concerned with is further limited by the skills they have acquired or inherited for exploiting this information and, in particular, their semiotic abilities to produce signs and to interpret those produced by others or by the environments in which they find themselves" (Lestel 2002: 59).

inherit animal codes or rationality by birth. These are skills learned by growing up together (Sebeok 1981: 115). In the process of socialisation, the young animal is desensitised[22] to physical handling, loud speaking, laughing, singing, whispering, coughing, sneezing, smiling (teeth-exposure) and many other behaviours common to humans (Fig.3). In that way, the animal will learn to accept these behaviours as natural and a non-threatening part of human communication.

Figure 3. Wolf pups being safely desensitised to novel objects (camera) and human smiling.

At this point, one could ask why can't the animals be desensitised to all potentially threatening elements of human behaviour, including direct eye contact, fast and wide movements, and high body posture? The answer lies in the fact that these are threat signals individually and are, hence, much more difficult to desensitise (whereas, for example, smiling is more threatening when accompanied by a certain body posture and facial expression). It is not practically possible to

[22] Desensitisation means safe and nonthreatening introduction of novel experience (Addams, Miller 2007: 74–75). It is extensively used in the process of socialisation as living in a human environment and meeting people can involve experiences (for example, loud or aversive sounds, arousing odours, unnatural or synthetic materials, human handling) that are very unusual in the animal's natural lifestyle and can therefore be frightening and stressful for the animal (Addams, Miller 2007: 74–75; Hosey *et al.* 2009: 227). The most efficient way of desensitising is to start during the "critical period" of the young animal's development when it "has no inbuilt knowledge of what is and is not 'normal' and is inclined to accept novelty rather than fear it" (Addams, Miller 2007: 75).

desensitise *all* potential human threat signals as it would be too time-consuming. Plus continuous exhibiting of threat signals could be too stressful for the young animals (and could therefore have a damaging effect on their socialisation). In addition, there might be situations in the future where threat signals could be benefited from. For example, when bringing new people in with wolves, the people are usually asked to stay standing (not in order to threaten the wolves but to appear less vulnerable) until the wolves have confirmed their acceptance of and positive attitude towards the strange people.

Humans, too, learn about the codes of the animal in the process of hand-raising. For instance, appeasing signals (small eyes, lip-licking, turning sideways, non-threatening body movement, etc.) are an everyday tool in calm and safe communication with animals (Fig. 4, Fig. 5). Also, when teaching the fox kits and wolf pups that humans are not to be bitten, I used auditory cut-off signals that I had observed the animals using with each other when they had crossed the borders during social play. However, such kind of imitation of the other species' codes is rather an exception than a rule. Namely, the third aspect about codes is something that does not seem to be widely known: being aware of the species-specific communicational aspects does not mean that people should try to "speak the animal's language", i.e. communicate prevailingly by codes similar to the codes in the animal's intraspecific communication. The reason lies in the mere fact that humans are not capable of producing all the species-specific signals used by the animals. Trying to imitate them could result in confusion and frustration for both communication partners. For example, in dominance displays, canines try to avoid fighting by providing the other with various warning signals (both consciously and subconsciously transmittable): lateral display,[23] facial expressions, vocalisations, piloerection,[24] pheromone signals, etc. (Addams, Miller 2007: 8, 85). Humans are not competent enough (if capable at all) in communicating with such signals through such channels. Human attempts to dominate an animal usually result in the overuse of physical aggression, which could easily increase the animal's fear of humans and potentially result in a defensive attack by the animal (Addams, Miller 2007: 87).

[23] Lateral display – a behaviour where the animal "walks side-on to their intended targets, displaying their largest dimension, with their back and tail arched, […] legs extended, […] ears held parallel to the ground, […] and their fur piloerected" (Addams, Miller 2007: 8).

[24] Piloerection – "the raising of fur by muscles attached to the hair root, most often seen in the back of the neck, the shoulders, down the back and occasionally on the tail. This raised line of hair is commonly called the 'hackles'. An autonomic reaction, and therefore a good indicator of an animal's mood, as the animal cannot consciously control whether its hackles are up or down" (Addams, Miller 2007: xi).

Figure 4. A visitor using appeasing signals.

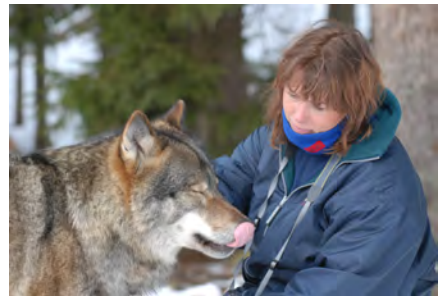

Figure 5. A wolf using appeasing signals.

This is the reason why getting involved in dominance relationships with animals is not viewed as a proper method of socialisation in this article. Dominant-submissive relationship between animals is a "consistent relationship between individuals – one of whom 'wins' in ritualized aggressive displays, while the other regularly and voluntarily submits" (Handelman 2008: 84). It requires clear communication and is, in essence, a survival strategy rather than a forced power-relation. A human–animal dominance relationship is usually forced and fear-based, which is not compatible with the goals of socialisation as social conflicts and fear of humans is exactly what has to be avoided for the described reconstruction of the animal's umwelt. For example, in a wolf's umwelt, dominant pack members do not occupy the phenomenal field of an enemy – all pack members cooperate in everyday tasks and are partners regardless of their rank. The only exception could perhaps be the moment when the pack is trying to disperse the omega or to challenge the alpha wolf (which sometimes could result in fatal injuries for that one wolf) (Næss, personal conversation, 14.05.2014). Wolves from other packs are potential enemies, but there are no dominant-submissive relationships between wolves of different packs. On the other hand, human attempts to dominate a wolf – due to the communication problems described above – tend to position the human on the phenomenal field of enemy instead of partner in the animal's umwelt.

Thereby, I find the term 'leadership' much more adequate when talking about teaching the animal acceptable social behaviour with humans. "Leadership is the ability to influence others to perform behaviours that they would not necessarily perform on their own" (Yin 2007: 415). It is crucial to understand that a strong human leader modifies the animal's behaviour by bestowing or withholding resources, not by using aggression and dominance (Handelman 2008: 85; Yin 2007: 415). Here one could draw a parallel between being an authority and being an authoritarian (or a dictator). A good leader anticipates social conflicts

by means of distraction[25] or substitution[26]. If the situation is of a more serious kind and none of the previous methods seem to have an effect, the keeper could resolve the situation by using cut-off signals that signify a disliked behaviour. It is important to understand that the cut-off signal itself is not a punishment but is rather a sign that indicates that a punishment is coming should the animal not stop the undesired behaviour. The punishment in the latter case would simply be a "time-out" (i.e. a form of "non-reward" or negative punishment where the animal is deprived of human interaction). (Addams, Miller 2007: 78–79) These methods, coherent with positive reinforcement training principles, enable the solving of critical situations without damaging the animal's perception of humans, while still keeping the experience of both the animal and the human positive (or at least as positive as possible).

Summary

The article explains the essence of the highly semiotic process of socialisation of wild captive animals with humans for animal welfare purposes. Although there are many more nuances about the methods of socialisation not discussed in this article, the main semiotic methods of socialisation were brought to light.

When approaching the phenomenon in question from the perspective of umwelt theory, it becomes clear that socialisation is the process of reducing the animal's fear of humans with an ultimate goal of reconstructing the animal's umwelt by changing man's meaning-carrier of enemy into the meaning-carrier of social partner. It has the most favourable effect on animal welfare if the animal is generally socialised so that the process includes reducing the animal's fear and improving its perception of unfamiliar people (including zoo visitors). As a result, the animal will feel more comfortable living in a human environment and exhibiting its full range of behaviour in the presence of humans (Addams, Miller 2007: 10).

The level of socialisation considered adequate in this article requires the animal's social imprinting on humans (possible to achieve by hand-raising a litter of animals during their "critical period" of imprinting), taming via methods

[25] Distraction – preventing behaviour before it happens by distracting the animal from undesired acts. An animal could be distracted by using anything that would draw its attention, e.g. velcro, car keys, crinkle of plastic wrap, a cardboard box, movement in leaves, touching its leg or tail, waving with some object, etc. (Addams, Miller 2007: 76–77).

[26] Substitution – offering the animal a better object to trade with or training the animal to perform an incompatible behaviour on demand. For example, when the animal has taken hold of a person's glove, a keeper might offer the animal an attractive branch, ask it to run to a specific place to receive a treat, give it a cue to roll over and sit, or use another effective option. However, in order to avoid reinforcing the undesired behaviour, the animal should not be given treats as a trade item (Addams, Miller 2007: 77).

beneficial to building positive trust-based human–animal relationships, and in many cases (for example in zoos), habituation to unfamiliar people. It is important to understand that socialisation is a lifelong process that depends on continuous, positive human–animal interactions. The latter is only possible when the communication between a man and an animal is efficient. Therefore, profound insight into the animal's species-specific behaviour and different aspects of interspecific communication (including codes, channels and contexts) is required. All things considered, socialisation is ontologically a semiotic process that requires a constant awareness of the semiotic aspects in the animal's umwelt.

Acknowledgements

The research for this chapter was supported by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Communication in the study of zoological gardens

Nelly Mäekivi

> "[…] if there were no zoo, someone would invent one. And many have done so over the past 5,000 years, in various ways." (Kisling 2001a: 1)

Introduction

This chapter has in its centre the analysis of primarily nonhuman but also human communication, and it aims to discover how human cultural perceptions, attitudes and management influence animal communication with its conspecifics, other species and the environment. J. von Uexküll's concept of umwelt (e.g. Uexküll 1982; chapters 1 and 2 this volume), A. Farina's and A. Belgrano's concept of eco-field (e.g. Farina, Belgrano 2006) are essential in analysing zoo animals' communication. In addition, H. Hediger's work on zoobiology (e.g. Hediger 1964, 1969) proves to be crucial in the context of the zoo. This chapter proposes that a more holistic view, which is inclusive of animals' communication, is the best basis for comprehending and helping to resolve the difficulties that zoological gardens face in their endeavours.

Zoological gardens are hybrid environments, where the cultural environment is intertwined with nature and where intra- and interspecies communication, including that of humans, takes place. In addition, these social, cultural and conservational institutions impart messages of their identity and goals. How the zoo environment is perceived by people and how its inhabitants and humans are able to communicate with and within this environment is dependent on the zoological garden's historical background, designed environment, goals and portrayed self-image. As semiotic research objects, due to their hybrid nature, zoological gardens prove to be remarkably rich and diverse, providing myriad interconnected semiotic aspects to inquire about. Understanding the interconnectedness and complementarity of the biological, ecological and cultural sides of many topics in the study of zoological gardens should reveal why inconsideration of or disregard for different aspects that are involved in constituting zoological gardens may lead to discrepancies or conflicts in the ways that zoological gardens operate.

As a starting point, this chapter undertakes the problem of conceptualising and framing zoological gardens, considered in such a way as to reveal the foundations of zoological gardens' aims within culture. Facets of zoos that will be further discussed are the designed and limited space and the human control over zoo animals. As a conclusion, some suggestions for future endeavours of zoological gardens are proposed.

1. Defining zoological gardens

There are a variety of institutions that can be considered to fall under the category of zoological gardens: aviaries, insectariums, rehabilitation centres for endangered species, safaris, conservation parks, etc. (Kisling 2001b: viii). There is no one commonly agreed upon definition of "zoological gardens" or of a "zoo". The way that institutions describe or represent themselves may not coincide with how other interest groups perceive zoos and identify their functions. These perceptions may vary from "collections of animal exhibits open to the public" (Lee 2005: 1) to a statement such as this: "Zoos are much more than places that display animals; they are centres for education, conservation, and science" (Bonner 2006: 8). The emphasis on either exhibiting animals for recreational purposes or conserving species for the sake of sustaining biodiversity, and every other definition falling in-between these extremes, is open for discussion when defining zoological gardens. The self-image of contemporary zoological gardens stresses the educational, conservational and scientific function of a zoo; however, historically the recreational facet is the oldest and is still the most prevalent among zoogoers. In order to shift the perceptions of zoological gardens among different interest groups, zoo personnel aim to change the narratives surrounding their institution.

The technique employed by zoos in order to lift the burden of the historical heritage of exploiting other species purely for human pleasure, and to change zoo's status as entertainment centres, is to promote their changed functions through media and in the zoological gardens themselves. There are widely known instances where "zoo" has been substituted with a completely different concept, where the institution formally known as a zoological garden is now called a biopark or conservation park. "Offering a new name to these institutions makes a clear break from the old model, which is fundamentally exploitative" (Kemmerer 2010: 37). It is important to stress that these means of renaming are meant to rid the zoo of its cultural connotations, which reflect the history of the zoo.[1]

[1] "Zoological garden' itself came to be substituted for the term 'menagerie', which signified collections of wild animals gathered for the purpose of exhibition. Institutions established in the 19th century started calling themselves zoos because zoos were considered to be professional institutions – despite the fact that many of them were not professional in reality" (Kisling 2001a: 38–39).

Thus linguistic representations of zoological gardens contribute to their status in culture, and through the means of linguistic representations, an attempt is made to change these connotations. Today the cultural context that zoos belong to is largely shaped by environmentalist rhetoric in which zoos are presented as "Noah's arks" and as "gardens of Eden" – last resorts of disappearing wildlife. This rhetoric seems also to be the underlying dominant in contemporary zoo design. The enclosure designs are meant to support bio- or zoocentric attitudes, the landscapes are more natural and immersion exhibits absorb people into "nature" (see e.g. Hyson 2000).

The relevance of reframing zoological gardens' purposes and goals are thus not only important for changing perceptions and attitudes but also for the practical level of how animals are kept in zoos. The way that animals are managed should be in accordance with how they are perceived, which means that the environment created for them should emphasise the reasons for and goals of keeping wild animals in captivity.

2. Designed space of zoological gardens

Any zoological garden forms a communication environment for humans and nonhumans. The created environment offers and encourages some communicative situations; for instance, people are encouraged to learn about different species and to emotionally connect with nonhumans, while nonhumans are encouraged (to a certain extent) to express their natural behaviour. However, some communicative situations are prohibited or discouraged, e.g. humans are prohibited from disturbing or touching most of the species, and most nonhumans are prohibited from engaging in predator-prey relations. Although there are many different elements contributing to creating the zoo environment,[2] most of the communication is shaped by the design of a zoo. Hence, when considering the most prevalent form of zoological gardens – the city-zoo – there are two factors that need the most attention: the space limitation inherent to running a zoo and the designing of that space. These two factors play a crucial role in analysing how zoological gardens influence intra- and interspecies (including

[2] The developmental stage of a zoological garden (whether it is a *menagerie* type zoo or a contemporary establishment), the goals of the zoo (whether emphasis is put on scientific work, on conservation, or on education), the location of the zoo (climate and terrain, which condition the selection of species to be inhabiting the zoo), the size and type of the zoo (whether it is a city zoo or a biopark or something in between), the nature of the exhibits (whether they are arranged ecologically, taxonomically, etc.), the collection of the zoo (emphasis on the number of different species and animals), the financial opportunities and standards (resources for developing the environment for animals and belonging to different associations), and the zoo employees and visitors (their initiative to manage animals and communicate with different species).

human-nonhuman) communication and what effect the zoo environment has on the human perception of other species and on zoos themselves. It should also be acknowledged that the cultural framing of a zoo creates certain expectations of the visit (e.g. a nice family outing, an educational trip for school groups, experiencing nature, etc.).

2.1. Human communication in the designed space of a zoo

When discussing human communication in zoos, it is relevant to also consider humans as biological beings. Biological features, such as the perceptual and effectual organs that every species (including humans) possesses, compose the underlying structure that enables a being to relate to its environment (e.g. Uexküll 1982). In addition to cultural traditions and personal preferences, we as mammals are dependent on our physical build-up and the different communication channels at our disposal (see chapters 1 and 2 this volume). Relevant literature seems to portray zoos as places that offer a mostly visual experience: "it is the style of exhibition that makes a particular zoo experience unique" (Mullan, Marvin 1987: 59). This is understandable considering the high usage of visual communication channel by humans. In closed quarters, there are still murals on the walls imitating landscapes clearly meant only for people, not the animals inhabiting those quarters. Emphasis on the visual has also led to more nature-like exhibit designs.[3] This indicates that there is always a part of exhibit directed at the aesthetic experience of humans. The design of exhibits that emphasise natural looking scenes can be called iconic naturalism (Lindahl Elliot 2005), due to its mimicking nature to a certain extent. In addition to the visual channel, people are also encouraged to use a verbal medium and abstract thinking when in zoos, because next to enclosures one can find signage not only of the concrete animal(s) kept in that exhibit but also references to its natural habitat, scientific name, etc.; basically, one can find signs with information that is not directly perceived by people, but that enables them to compare the immediate with the abstract (Lindahl Elliot 2005). This sort of representation is symbolic-scientific, which indicates that visitors are encouraged to make use of verbal communication and an abstract approach to animals, thus enabling zoogoers to relate the animals they encounter in zoos with their wild counterparts (recognising distinctions and similarities in behaviour and/or morphology) (Lindahl Elliot 2005: 94, 2006: 219). The analysis of signage can reveal what zoological gardens consider as important information to impart, what kind of discourse and rhetoric are used, and what kind of attitudes different animals and signage cause in visitors. In addition, symbolic-scientific representation is also closely tied to our usage of the

[3] An additional reason is of course being in accordance with animal welfare and general keeping conditions.

visual communication channel, due to the visual appeal of different signs and of animals themselves. It is widely acknowledged that people tend to prefer to look at animals whose features are similar to us (i.e. large mammals) (Lacy 1995), whose umwelten are most compatible to ours.

However, despite the visual inclination, in zoological gardens there is a tendency to simultaneously encourage the use of all other senses at the disposal of humans. For instance, the scent of the zoo is specific and often commented upon by people, so there could also be scent boxes for people to explore; there are also different sounds to hear, textures of surfaces to touch, and animals in petting zoos to be stroked. In essence, it can be argued that zoological gardens are in fact indexical-multisensual places, which encompass any activity that makes visitors use all of their senses (Lindahl Elliot 2005) in order to get the fullest experience from a zoo visit.

In addition to all beings employing different communication channels, in the context of zoological gardens and from the point of view of humans, there is always the question of ethics in keeping wild animals in captivity, away from their natural environments. Thus, communicating the purposes of zoos proves to be important. Since zoological gardens state that animals are managed out of their natural habitat so that species could be saved and people could be educated on environmental matters, this offers a more acceptable ethical ground for keeping animals in captivity than if nonhumans were in zoos merely for human pleasure. Closely tied to the issue of keeping animals *ex situ*, i.e. outside their natural habitat, is the question of the conditions that the animals are or should be kept in, and how those conditions mirror the functions of zoos, correspond to people's perception of animals, and influence animal communication.

For people, the limitation of space in zoos elicits the most conflicting emotions. People want the animals to live in nature-like enclosures which project the feeling of the animal's natural living, but on the other hand they want something totally unnatural from the point of view of wild animals: humans want to interact with nonhumans. Animals *in situ*, i.e. animals living in their natural habitats, usually do not present themselves; they tend to hide from people. However, any zoo would be unable to earn its revenue to support its endeavours if it could not guarantee that humans would be able to meet nonhumans during a zoo visit. One of the main motivations behind a zoo visit is to meet other species, to see and interact with wildlife. It is getting acquainted with a world that usually does not present itself that creates the thrill for the visitor. Meeting animals also encourages empathetic attitudes, which is in turn used by zoos to impart their conservational message. However, it is difficult to project one's feelings towards someone that cannot be seen or met. Thus, from the point of view of the visitor, there are two factors that have to be accounted for in zoo design: the animals have to be seen, and the enclosures have to be naturalistic. It is unacceptable

for zoogoers to see animals living in old barred cages with concrete floors – the exhibits have to look natural and not seem cramped. So a lot of exhibit design is created as a compromise, where the exhibits must not only guarantee good welfare for the animal, but also they have to satisfy the needs of humans and be attractive. This is also a reason why great emphasis is put on not only fauna but also flora. Today the flora sometimes constitutes as important a part of the exhibit as the fauna does. In designing a natural-looking exhibit, it should be also taken into account that due to vegetation it is much easier for the animal to hide itself from visitors, which in turn might again give rise to dissatisfaction with the visit. Thus zoological gardens must put a lot of thought into designing the space: it cannot be too small and artificial looking, but it cannot be too natural either; in addition, granting animal welfare is crucial.

2.2. Nonhuman communication in the designed space of the zoo

From the stance of nonhumans inhabiting the zoo environment, the limitations of space inherent to city-zoos and the design of that space pose additional problems to be solved, especially considering animal communication and animal keeping standards. The zoo environment should provide the animals with opportunities to express their natural behaviour to the fullest possible extent in *ex situ* conditions. Natural behaviour of course differs from species to species (and may vary even between individuals of the same species depending on their age, gender and personal preferences). Zoobiologist H. Hediger was probably the first to deal with the issue of space needed for animals in zoos by writing about the specific spatial needs of animals. He explicated that spatial needs depend on the animal's body size. When designing zoo exhibits, according to Hediger, the diameter of every enclosure should be composed of *at least* two flight-distance lengths, because if the enclosure is approachable from opposite sides, the animal can at will still remain at a safe distance from people even if latter are present on both sides. The length of the flight-distance is dependent on the species, the individual, and the degree of the threat (Hediger 1964: 32–33). Since the communicative abilities of different species and the peculiarities of different individuals vary immensely, this should also be accounted for. This variability indicates that in reality it is very difficult to actually calculate not only the minimum but also the optimal size (i.e. the size that enables the animal to perform all of its natural behaviours with regard to space) of an enclosure. Of importance is not only the diameter of an enclosure but, depending on the species, also the height and depth. It is evident that the minimum size of an enclosure might not allow the animals to express some of their behaviours to a full extent (e.g. running or flying long distances); this is due to the limitations of the entire size of a city-zoo. It is also clear that

guidelines for enclosure sizes are normative for a given species[4] and usually do account for specific individual needs (e.g. non-tame animals' flight-distances are longer, and these animals thus require more space than conspecifics that are tame because the latter do not perceive humans as a threat). The animal's individual needs for space and its complexity are usually accounted for when the animal is already living in a built enclosure (e.g. through enrichment).

The size of the space is not the only variable, as mentioned before; another variable is that wild animals tend to hide from people if given the chance. Thus, many of the zoo animals are tamed, which means they are not constantly afraid of people, and their flight distance is reduced. Taming the animals also plays a crucial role in the animal's relation to its environment because, from the stance of zoobiology, it is important to emphasise that tame animals are owners of their territory. Tame animals mark their *ex situ* living quarters the same way as their *in situ* conspecifics; they do not have the urge to escape. However, from the point of view of visitors, holding animals in captivity as "prisoners" is the way people may interpret the keeping of wild animals in zoos,[5] especially if the exhibits are old-fashioned and not nature-like. It can be argued that for an animal it is more important to have places to rest, eat, and groom (the quality of space) rather than to enlarge the space by ten times (the quantity of space) (Hediger 1969: 197). Eventually the created space has to correspond to the animal's umwelt, not only to people's perception of the space.

In creating the environment for zoo animals, one should take into account the primary factors of limited space (inhibiting the freedom of movement in a physiological sense) and the secondary or indirect factors (deficiencies in the subjective world, e.g. a lack of activities and versatility or inhibiting the animal in a psychological sense) (Hediger 1964: 31). The latter could be rephrased in a question: how rich is the zoo animal's umwelt in comparison to its *in situ* conspecifics?

2.3. Umwelt analysis of captive environments

In essence, according to zoobiology, there are two ways to approach the keeping of animals in a limited physical space: designing the space in as much correspondence to the animal's capacity of movement as possible, or inhibiting

[4] For example, in 1997 the minimum standard for keeping one lion (*Panthera leo*) was considered to be 27.9 m^2 (Shoemaker, Maruska, Rockwell 1997); however the standard issued in 2012 stated that the minimum space for an indoor facility should be 185.8 m^2 and for an outdoor enclosure should be at least 929 m^2 (Association of Zoos and Aquariums 2012).

[5] It should also be taken into account that "the free animal does not live in freedom: neither in space nor as regards its behaviour towards other animals" (Hediger 1964: 4). This could be illustrated with an example of lions – they do not cover long distances because they enjoy the walk but because they need to find prey.

the capacity of movement according to the space (for instance, in the past it was common to pinion the birds). Today's standards for keeping wild animals in captivity accept only the first approach. In zoobiology, the main objective way to assess the suitability of the environment for the animal is the animal's reproductive success, because it is seen as a measure of welfare. However, there are plenty of counterexamples that speak against reproductive success as a measure of welfare; there are many species (e.g. brown bears and lions) who reproduce extremely well even in poor living conditions, while some species (e.g. giant pandas and mountain gorillas) have offspring very rarely in captivity, even in excellent keeping conditions (Wickins-Dražilova 2006: 29–30). Thus there is the question of the adequacy of objectively measuring how suitable the created zoo environment is for the animal and how much that environment relates to an individual and to the whole life of a nonhuman, not just measuring one aspect of it (i.e. reproduction). If it is sustained that spatial needs may differ according to age and gender (not to mention personal preferences), then reproduction cannot be the only measure for environmental suitability – there needs to be a more subjective approach that is inclusive of the variety of animal communication in a zoo environment.

An environment necessary to perform a certain function or activity can be called an eco-field,[6] which means that in order for the animal to perform a certain action in a certain context, the spatial arrangement must correspond to that activity (Farina, Belgrano 2006: 9). In zoos there is usually much more overlap of different eco-fields than outside of the institution. It can be argued that the zoo environment is saturated with different eco-fields, that they are accumulated, which indicates that there are many more possibilities for their (partial) overlap and intersection. For example, inside a single enclosure there might be much less physical space for the animals inhabiting that enclosure when compared to *in situ* animals, but most of the relevant eco-fields for meaningful behaviour may be present and fit into limited quantitative space.

One can assume that the effects of limited space and designed environment may affect various species differently. It is much more difficult to grant animals with rich umwelten the necessary qualitative space (i.e. all the necessary eco-fields for species-specific communication) than for some other species (like the small animals [e.g. *Daphnia*] caught from the freshwater puddle that were living in K. Lorenz's aquaria [Lorenz 1961]), whose umwelten are not so rich in perceptual and effector cues. The more complex the animal's umwelt, the more eco-fields the animal needs and the more difficult it becomes to enable them in a limited space. Thus it is proposed that the suitability of a zoo environment for a specific animal

[6] "Eco-field is defined as a spatial configuration carrier of a specific meaning perceived when a specific living function is activated. A species-specific cognitive landscape is composed of all the spatial configurations involved for all the living functions for a particular organism" (Farina, Belgrano 2006: 5).

should be analysed through the presence of the meaning-carriers necessary for the actuation of different functional circles and through the availability of the different eco-fields needed to fulfil all the activities of an animal. In addition to the presence of eco-fields, the degree to which an animal is able or allowed to perform the activities should also be accounted for.

It is possible that the created environment of a zoological garden may not differ at all from the animal's *in situ* environment because the factors that enable and influence communication may be alike both *in situ* and *ex situ*, which indicates that in the umwelt of the animal under scrutiny, there are no perceivable differences. To elaborate on this: all relevant eco-fields are fully present (including the overlap of different eco-fields, which facilitate and inhibit different actions), and all the necessary meaning-carriers are also present. The animal can communicate with other individuals and the environment in the same way as its *in situ* conspecifics.

There are also cases where there might be a distinction recognised by the animal, but this distinction may bear little relevance because all the functional circles are still complete (e.g. using man-made objects for playing or eating food that are not usually found *in situ*) even though the meaning-carrier has been altered. In this case, the comparison of the animal to its *in situ* conspecifics becomes more difficult – e.g. the animal, although having a good physical and mental well-being in a zoo environment, may have (severe) difficulties in its natural habitat if the meaning-carriers that have been altered in the zoo are not present in its natural habitat. A good example of the current situation would be food; one case would be that in zoos, alligator snapping turtles (*Macroclemys temminckii*) are fed mice (along with worms, fish, and prepared diet); however, *in situ* mice are not part of their diet because they live in large rivers, lakes or swamps and eat primarily fish.[7] This means that for a zoo alligator snapping turtle, the meaning-carrier of a mouse as food would be missing in its natural habitat, and depending on the proportion of mice in its diet and on its personal preferences (i.e. how much the turtle likes eating mice), the functional circle of feeding could be hindered.

There are also plenty of instances where the difference between *in situ* and *ex situ* environments is distinctly perceived by the animal due to the fact that some of the functional circles are incomplete (e.g. the animal is not allowed to act upon an effector cue to the full extent) or some of the eco-fields might be missing because they lack a necessary object (e.g. it is common in zoos to avoid the predatory-prey relationships of large carnivores, which indicates that the functional circle of hunting is excluded from the animal's life). This exclusion is usually implemented by the means of restricting space because different enclosures are physically separated from each other. However, those barriers do not totally confine animals'

[7] See the Smithsonian National Park homepage: http://nationalzoo.si.edu/Animals/ReptilesAmphibians/Facts/FactSheets/Alligatorsnappingturtle.cfm (Retrieved on 28.06. 2015).

communication. Although physical movement and tactile communication between animals in different enclosures are indeed restricted, sounds and scents spread beyond the borders. In addition, there are many ways of designing an exhibit that permit visual communication with other species. For example, in the Tallinn Zoo there is a snow leopard enclosure situated in the middle of enclosures for bovid species, because "when the sheep see predators next to themselves, they start raising the population due to the feeling of danger. And leopards are also encouraged to breed when they see potential food near them every day" (Voog 2009). Including also the properties of the chemical communication channel[8] in addition to the visual, it can be argued that according to given example, a major part of predator-prey communication is granted. However, a major part is also absent. It may be possible that what is absent proves to be the most relevant in *in situ* communication – the ability to find, hunt and kill one's prey and, for the *Bovidae*, to employ predator avoidance skills. This example illustrates clearly that the shortcomings of a created zoo environment that does not allow all functional circles to be fulfilled and offers only partial or incomplete eco-fields may prove to have serious (even fatal) consequences *in situ*.

2.4. Methods for improving captive environments

A way to minimise or overcome the quantitative and qualitative shortcomings of zoo space is environmental enrichment and exhibit designs. As discussed before, both serve the purpose of satisfying the public in addition to granting good animal welfare. Environmental enrichment is defined as a process of improving zoo animals' environments and care with the goal of increasing the behavioural choices of animals and thus enhancing animal welfare (Young 2003: 2). Enrichment is also meant for eliciting desired species-specific behaviours and thus for diminishing or avoiding stereotypical behaviours[9] (Hosey *et al.* 2009: 263), which are quite prevalent in large mammals living in zoological gardens (e.g. large cats and bears tend to walk or trot in a circle or in a figure eight pattern).

If enclosures today are usually designed together with architects and ethologists (see e.g. Ebenhöh 1992), then enrichment is still something considered as an afterthought, i.e. when the exhibit has already been built (Young 2003: 45). To elaborate on this: environmental enrichment is modifying the already created environment to the needs of an animal inhabiting that environment. So enrichment offers a much more subjective approach, which enables the inclusion of the personal preferences and peculiarities of the animal(s) inhabiting that enclosure (e.g. whether there should be one or many eating and hiding places,

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8 Smells can last for long periods of time and can travel long distances, and darkness constitutes no problem.

9 Repeated and non-variable behavioural patterns, which are usually nonexistent in *in situ* animals (Margodt 2000: 50).

whether there should be platforms on different levels depending on the social hierarchy, etc.). Observing and analysing nonhuman communication with and within this environment prove to be crucial. This sometimes leads to situations where, in order to grant good animal welfare, there is no need to add something but rather to remove something (e.g. so that animal would not come to harm, like with hard plastic toys that chimpanzees may throw at other individuals rather than play with the toys [Young 2003: 62]). In essence, environmental enrichment can be divided into two large categories: the naturalistic approach and behavioural engineering. The naturalistic approach has its basis in creating as natural-like conditions as possible in order to stimulate animal behaviour; behavioural engineering concentrates on different gadgets and machines that animals must operate to receive some sort of reward (e.g. treats) (Young 2003: 5). From the perspective of an animal, it may bear no difference whether the enriching objects actually look natural or not, because what matters for the animal is what can one do with the object (Young 2003: 9). If the object has properties that bear necessary perceptual cues (e.g. movement patterns of the object or scent) and that enable the animal to act upon them (through effectual cues *sensu* Uexküll), other properties of the object (e.g. shape, material) may become irrelevant. Thus the behaviour of an animal may not be unnatural simply because the objects are man-made and are perceived as unnatural by humans. However, due to the perception of humans, zoological gardens tend to employ more natural looking objects that are in accordance with the needs of nonhumans.

All things considered, it is fair to argue that contemporary zoos try to design their exhibits in a way that is in accordance with their scientific, educational, conservational and also recreational goals (Young 2003: 5). The balance is not always easily found; designing more natural looking exhibits might be in accordance with recreational and educational aims (the latter because naturalistic exhibits make it easier for people to relate to animals' *in situ* environments), but from the stance of the scientific aims regarding natural animal behaviour and conservational functions, the successfulness of the exhibit is measured by the behaviour of an animal, not by the appearance of the exhibit (Margodt 2000: 71). Thus there are instances where the exhibit looks more appealing to humans but limits the behaviour of an animal, e.g. the current trend of substituting bars for plexiglass. For people, plexiglass might create the illusion that there is no barrier between humans and nonhumans, that animals are not in "prison", and that the animals thus have more nature-like living conditions. However, there are many species (e.g. new world monkeys) that use the bars for climbing and are now deprived of that opportunity due to plexiglass (one of their eco-fields is removed). There are also other instances where the well-being of animals may suffer due to visitors' attitudes (e.g. animals are prohibited from moving to back quarters during the opening hours of the zoo so that the animals cannot hide from the visitors). For this reason, the resources available for the zoo require

careful planning to guarantee the highest possible welfare of the animals, which pays the deserved attention to animal communication while simultaneously trying to meet the visitors' needs.

3. Human management effects on nonhuman communication

Another common feature of zoos is that animals are always managed by humans who have the power to decide what and how much nonhuman zoo inhabitants eat, who they mate with, who and how much they have contact with, how their enclosures are designed, etc. As with the constriction of space, human control over animals and the effect on animal communication may vary in degree.

In the principles of keeping wild animals in captivity, it is noticeable that there are some controversies, namely, simultaneously with providing the animals as many possibilities to exhibit species-specific behaviour as possible, an attempt is also made to maintain the well-being of individual animals. The latter indicates that animals should be kept in a way that avoids stress, injuries and factors causing death; they are usually prohibited from predatory behaviour, and dangerous conspecifics or other species are removed from their enclosures (Lee 2005: 64–66). Thus there are distinct differences in the lives of *ex situ* and *in situ* animals. It should be stressed once again that not all species are influenced by these differences. It can be argued that most of the communicative differences (with some exceptions) of zoo animals compared to *in situ* conspecifics are still evident in cases where the well-being of an animal is not granted. Most often the failure to fully follow guidelines regarding the animals' well-being arises from the objectives of a zoo (e.g. inducing stress by transporting animals between zoos for species conservation purposes or the aforementioned instance of keeping animals on display for educational and recreational reasons).

Human control over nonhumans has its effect depending on the complexity of the umwelten of different species and on the specific characteristics of an animal. The more complex the umwelt, the greater are the possibilities to interfere (willingly or unwillingly) with the functional circles of the animal. The most prevalent communicative differences between *in situ* and *ex situ* animals appear in intra- and interspecies social communication.

Concerning inter-species communication, distinct social groupings might evolve – for myriad reasons, animals not inhabiting even the same continent might form social bonds in zoological gardens. This means that a (social) meaning-carrier is created in their umwelt (in cases where an additional animal is integrated to the animal's umwelt), or the meaning-carrier can also be changed, such as when an animal comes to substitute another animal (e.g. in the cases of sexual imprinting). For animals, these communication situations may be

positive, such as primates from different species (capuchin monkeys [*Cebus apella*] and squirrel monkeys [*Saimiri sciureus*]) who show affiliative behaviours towards each other (as in the Edinburgh zoo) (Leonardi *et al.* 2010). In such cases, the umwelten of different species may overlap to the extent that enables them to recognise common communication contexts (tigers and lions that are known to even produce offspring in zoos). There are also instances where communication with a representative from another species might have a negative effect on the animal because the indications to the communication situation might be incomplete or obscure due to the differences in umwelten. These instances sometimes lead to conflict or aggressive behaviour, as in the Antwerp zoo in Belgium when two different species of dolphins, *Tursiops truncatus* and *Sotalia guianensis*, were made to share living quarters, and *Sotalia guianensis* exhibited aggressive behaviour towards *Tursiops truncatus* (Margodt 2000: 33–34). Humans, while managing other species' inter-species communication, also constitute one of the parties in communication. As discussed before, wild animals tend to flee from humans; thus taming and socialising animals serves the purpose of changing social communication contexts. Thus, if a wild animal interprets the meeting of a human as an antagonistic situation (as is usual in the case of predator-prey relationships), then an animal wants to disrupt it by fleeing. However, in communication with a tame or socialised animal, the human is perceived as neutral or even as a companion (e.g. for play).[10]

With regard to intraspecific communication, a very common factor influencing communication is transporting animals between different zoos. Accredited zoos share the International Species Information System (ISIS), which contains data that determines which animals should have offspring together in order to sustain the biological diversity of the species' gene pool. However, the translocation may have an unwanted effect on animal communication, such as the disruption of communication and intraspecies social bonds that the animal has already created in the previous zoo. Depending on the species-specific social structure and behaviour, transporting animals may bear different effects on animals. For example, nonhumans that create especially strong family bonds (elephants, wolves, orcas, lions, etc.) may suffer tremendously from the disruption of communication because many, if not all, meaning-carriers for social activities (grooming, playing, etc.) are erased. For animals with social hierarchies, it may also happen that the social group must rearrange its social hierarchy due to the leaving of an animal. In addition, for the animal moving to a new environment, it means meeting new individuals, e.g. new partners. Often this sort of forced communication may fail because animals may not be interested in the other conspecific and may even exhibit aggressive behaviour. For instance, in Motroparks zoo, a toe of a female gorilla had to be amputated

[10] For more detailed account on human-nonhuman communication in zoological gardens see e.g. Hosey 2008.

because she and a male that had been brought into her enclosure in the hopes of mating fought with each other (Margodt 2000: 42). To avoid rejection from conspecifics and to avoid transporting animals altogether, sometimes the normal communication sequence is interrupted; it is not uncommon for female elephants to be impregnated and to give birth without ever meeting their partner and mating. This means that the communication process that might be relevant in the animal's umwelt is eliminated, but the end result of that process (i.e. giving birth) still follows without the animal conducting the necessary activities for that end result. However, it might be argued that for some solitary species (e.g. bears or tigers), the translocation may be less stressful regarding intraspecific social bonds because social bonds may bear less relevance in their umwelt (except during the time of cub-raising for females) in comparison to animals that create strong social bonds.

Sometimes offspring are separated from their parents to enable the parents to have more offspring in a shorter timespan, or due to the fact that the parents are simply unable to rear their offspring (e.g. they have rejected their offspring). In that case, no bond is created between a parent and the offspring, which in some cases may in the future hinder the offspring from rearing their own offspring. This again proves to be an important point for species that teach their offspring about social communication and about communication with the environment (animals that create strong family bonds). These species introduce new meaning-carriers to their offspring (who/what is edible and who/what is not, who/what to be afraid of and who/what is harmless or a friend); they teach them different eco-fields (where to find water and food, where to build a nest or a burrow). For social animals, the most extreme case of disrupting communication is isolation – sometimes the poor health of an animal or incompatibility with his conspecifics demands separation. This may have the same kind of effect on the animal's umwelt as translocation, but it may prove to be permanent in cases where isolated animals, due to their illness or aggression, are not reunited with their conspecifics and remain solitary till the end of their lives. Obviously the umwelt of isolated social animals becomes much poorer due to the removal of many meaning-carriers and thus also of functional circles. However, as mentioned above, there are also cases where zoological gardens do not have the opportunity for an injured or incompatible animal to be removed from its conspecifics, which again means that forced communication (that which the animal does not want to participate in) takes place. This may cause stress in both counterparts and result in conflicting behaviour, due to irritation- or stress-inducing meaning-carriers being always present and unavoidable.

To summarize possible negative effects of human management on the social communication of zoo animals: there are situations where the communication between individuals is coerced or forced (e.g. aggressive animals sharing an enclosure), which is indicated by the constant stimuli of an unpleasant meaning-

carrier; is disrupted (e.g. a keeper loses its ability to care for an animal; offspring are removed from their parents), which means that some meaning-carriers are removed (and sometimes substituted with others); or is eliminated (e.g. predator-prey relations; calving without mating), which indicates that certain meaning-carriers and functional circles are absent altogether.

Thus it seems that although zoo environments are richer in eco-fields when compared to *in situ* environments, the main reasons for communicative differences arise from forcing or disrupting communication, or from the absence of social communicative contexts. This observation proves to be important when considering one of the zoological gardens' main goals – species conservation – because the survival potential of the reintroduced animals depends on their communicative competence in their new environment. For many species, this competence also includes what they have already learned from their parents and conspecifics: how they are able to carry out observational learning and create social relations in their new environment. Although the animals up for reintroduction are usually maintained away from visitors and thus, in their case, the zoogoers' expectations do not have to be met, animals are still reared under human management in captivity. This means that if there are significant differences between *in situ* and *ex situ* environments, there may be serious repercussions to the animals' abilities to adjust to their new environments and may seriously jeopardise their survival success. In turn, this affects the zoo in reaching its goal of species conservation.

This means that in order to conserve a species, it is important to consider individuals that constitute the species. The animals should not be regarded as purely members of a gene pool. In addition to genetic diversity, it is also important to maintain animals' species-specific communication and to account for them as subjects with umwelten. Otherwise the reintroduction programs will not succeed. So it seems that in order to achieve the goal of species conservation, the zoo environment must be created in a way that is compatible with the animal's umwelt and provide all the necessary eco-fields for intra- and interspecies communication and possibilities to cope with the environment itself (e.g. distinguishing between eatable and uneatable objects, suitable and unsuitable materials for nest building, handling extreme weather conditions, etc.).

Conclusion

Considering the interconnectedness of cultural, biological and ecological facets in topics relevant to zoos facilitates uncovering the reasons behind why it is often the case that what visitors desire, what animals require, and what zoological gardens are set to achieve are not in accordance with one another. A semiotic approach offers a fertile ground for analysing human and nonhuman intra- and interspecies communication and communication with the environment, thus enabling the discovery of the shortcomings of the designed space of the zoo and of the possible effect of human perceptions and animal management on animal communication. This indicates that a more subjective approach that is inclusive of animal communication has the potential to aid zoological gardens in zoo animal behaviour studies, in their enclosure design principles and, most importantly, in their conservational endeavours (e.g. reintroduction programs). The suitability of a zoo environment for a specific animal should be analysed by considering the presence of the meaning-carriers necessary for the actuation of different functional circles, the process of functional circles (whether they are complete or incomplete), and the availability of the different eco-fields needed to fulfil all the activities of an animal (and the degree that animal is able or allowed to perform the activities).

Some of the questions that may prove to be fertile for future research about animal communication in zoos are the following:

- Are all the necessary meaning-carriers for a specific animal present in the zoo animal's umwelt?
- Are the meaning-carriers the same as for conspecifics *in situ*? One should take into account also the age and gender of the animal. As to personal preferences, are the personal peculiarities of an animal with regards to meaning-carriers hindering its possible future communication *in situ*?
- Are the different meaning carriers of a zoo animal easily substituted? Are the meaning-carriers of a certain function different compared to the meaning-carriers of animals *in situ*? Is the meaning-carrier important for the animal (as with imprinting) and thus difficultly substituted (if at all), or irrelevant (as with a random object of play) and thus more easily substituted?
- Can the zoo animal perform all the species-specific functional circles?
- Are all the species-specific eco-fields present? Is the animal able (or allowed) to make use of all the eco-fields?
- Are the eco-fields similar to *in situ* eco-fields? Would the animal be able to perform the same activity *in situ* (e.g. to locate prey)?

This list is by no means exhaustive, but it offers a starting point for analysing zoo animal communication and also enables us to compare it to *in situ* conspecific communication, which in turn proves to be relevant for species conservation.

Acknowledgements

The research for this chapter was supported by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Semiotics of textual animal representations

Kadri Tüür

Introduction

Art, including literary creation, relies on carefully selected, elaborated and sequenced representations of the reality that is accessible to us, as well as of the imaginary realms that need mediation in some art form, in order to be shared between humans. In the contemporary world, picture-based representations of nature, such as nature documentaries and albums of nature photography, and even cartoons and mobile applications, form a substantially more important way of consuming nature representations than the written word does. However, the focus of the present chapter is on literary representations, particularly on nature writing as a specific type of literary creation where the emphasis is on representations of nature. A number of principles that are employed in nature writing are also applicable to nature representations in other forms.

The present analysis of nature representations is exemplified by the representations of birds in the text "Sounds" by Fred Jüssi, the most well-known Estonian nature writer today. This text has elsewhere been analysed from a rigorously zoosemiotic point of view (Tüür 2009), and contextualised in the historical overview of Estonian nature writing (Maran, Tüür 2001). In the following, the notion of representation is discussed from the semiotic point of view, and it is subsequently associated with the concept of the nature-text as a complex semiotic object that is created in the interaction of natural and cultural elements (as elaborated in Maran 2007a). The underlying questions for the analysis are: How are nature-texts created, and what are the specific strategies of reading them? Where do our umwelten overlap with other species? What epistemological and conceptual difficulties arise when it comes to the mediation of other species' umwelten by means of human sign systems?

1. Nature writing as a hybrid object

As stated in chapter 2 of the present monograph, semiotics is an especially suitable methodology for studying hybrid objects – phenomena that extend beyond one certain domain of human activity, a discipline, or a commonly agreed classification. Our present set of research questions addresses both the cultural and natural phenomena that are expressed in nature writing. Traditionally, nature writing has been addressed in the framework of ecocritical studies where the focus of inquiry has predominantly been on the literary qualities of the texts, such as genre, tropes, metaphors, style, ethical and philosophical content, and so on. But as nature writing contains nature, as the term itself indicates, the 'nature' part also needs to be addressed. In addition to the discussions about what the various cultural meanings of 'nature' are, it is also worthwhile to have a look at how the enormous array of non-human reality is represented in literary form. What are the aspects that have been picked from the environment or from the behaviour of certain species, how have they been rendered in sign systems characteristic of human communication, and how does it all function in different communication situations – both in intra- and in interspecies' ones? In short, nature writing can be explained as a phenomenon in the intersection of the umwelten of different species. Approaching nature writing as a testimony of interspecies' communication may teach us many interesting things about other species, but most importantly about our own.

In order to study nature writing semiotically, we must thus agree that it is a hybrid object that expands beyond the interest sphere of just one discipline, such as literary criticism. Nature writing is actually an exemplary hybrid object *sensu* Bruno Latour (1993), as it challenges and overcomes the typical modern distinctions between culture and nature, between human and other animals, and between objective and subjective.

In the second chapter, three instances are listed where hybrid objects emerge: a) in human–animal communication when the umwelten of different species partly and temporarily overlap; b) when the communicative and interpretative activities take place between an individual body and its endosemiotic processes; and c) between human culture and the natural environment. Nature writing as a hybrid object fits in the first category. It often describes an author's encounters with other species, be these animals, plants, or invertebrates. In order to establish a mutual contact, the umwelten of the participants in the encounter must at least minimally overlap – although in many instances the human counterpart may act as if s/he was the only subject in the encounter. Semiotic analysis helps us to explicate the mechanisms that condition our communication with the rest of the world and, ideally, to make necessary corrections in our species' behaviour according to the research results.

According to the definition of fiction, literary representations do not necessarily have a reference in reality, i.e. in the world accessible to us through

the senses. Nature writing as a specific sub-field of literary creation relies on the representations of the phenomena in our environment. Nature writing in narrow sense is documentary prose that is based on the author's personal, bodily experiences in nature, informed by knowledge of natural history and biology in general, rendered in an elaborate style of writing. In the attempt to define nature writing in a narrow sense for heuristic as well as pragmatic purposes for the present chapter, we can rely on the dynamic model of nature writing as outlined in Tüür 2007. According to this model, nature writing is formed in the overlapping area between belletrist writing, essayist writing, natural history writing, and texts with a pragmatic function, such as handbooks. Nature writing is meant to inform, entertain, and also raise questions in readers about the natural environment that it represents. The question of representation is thus of different importance in the case of nature writing as compared to fiction. Whereas in fiction the 'adequacy' or feasibility of the representation is not of primary importance, it plays a crucial role in nature writing: for example, if nature is represented in a way that is for some reason perceived as inadequate by the readers, the piece of nature writing fails to function. One of the central intentions of a piece of nature writing is to give readers a personally presented, but still correct and up-do-date, knowledge about nature, be it about landscapes or about the other species that we may encounter in the wild. If these reader expectations are not met, the text loses its strength.

In practice, it may sometimes be difficult to draw a border between nature writing and other types of literary creation. American ecocritics have spoken of nature writing as a genre, but this is perhaps true only if we understand 'genre' as a conglomeration of the readers' expectations, just as Paul Cobley (2001) has explained it in his article about genres in contemporary media. Finch and Elder in their introduction to the "Norton Book of Nature Writing" discuss the problem of discriminating between what is nature writing and what is fiction (Finch, Elder 2002: 27). If we think of genre in structuralist terms, as a conventional way of structuring one's text and employing certain literary tropes, the variety within nature writing appears to be wider than a rigid definition would permit. Nature writing serves better as a heuristic device that helps to find and focus on the most exemplary texts that have the greatest potential to yield interesting results in ecosemiotic analysis.

In a wide sense, all writing has a component of nature writing because it is always based on human experiences of our perceived reality – even if reality is defamiliarised in literary creation, we are still able to recognise the defamiliarisation on the basis of our own environmental experiences. Also the resources necessary for writing always come from nature, whether we recognise it or not.

As a sub-field of literary creation, nature writing has the requirement that it should be written down in an elaborate style, and it most often uses metaphors and literary tropes as a crucial constitutive element of the story. Presumably this is also what differentiates nature writing from a purely scientific text – albeit not

entirely, because most research papers rely on metaphoric expression as much as any other human verbalisation. So we can conclude that nature writing reaches beyond the limits of literary creation into the realms of science, natural history, animal biology, autobiography, and so on. In order to bring all these varied aspects together into one coherent analysis, the understanding of nature writing as a hybrid object enabling semiotic study can be applied.

2. Nature-text: a reading

Each object, be it hybrid or "pure", requires a systematised approach in order to be successfully analysed. One suitable distinction here is between denotative and connotative meaning as outlined by Roland Barthes (2004). In the case of nature writing, denotative meanings are tied to the biological knowledge of the species, environments and communicative situations that are represented in a text of nature writing, whereas connotative meanings tie the text to its cultural context and pre-conditions, i.e. to the (often stereotypical) ideas about the conventions of nature representation that the reading public may have.

Another systematising tool that is used here is the notion of nature-text. Timo Maran (2007a: 269–294), combining the theories of the Tartu-Moscow school of cultural semiotics, zoosemiotics as devised by Thomas A. Sebeok, and ecosemiotics as proposed by Kalevi Kull, has put forth the model of nature-text that embraces several representational aspects of a text. The model is presented in Fig 1.

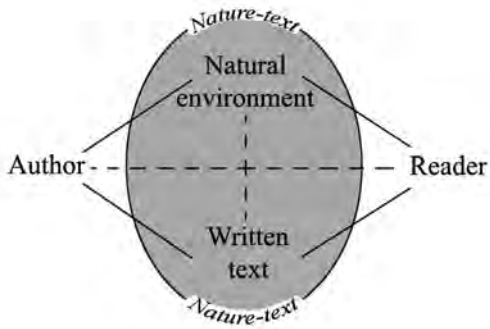

Figure 1. Components and interrelations in the complex of nature-text, from Maran 2007a.

The complex phenomenon of the nature-text is comprised of written text and the natural environment it relies upon. In the case of nature writing, the text itself is a result of an author's personal experience (hike, stay, observation) of

some particular natural place or species. As such, it is based on the natural environment and refers back to it. As a rule, the experience determines the structure of the text in some way – whether it is a ramble, a hunting story, a contemplation of magnificent landscapes and scenery, or an examination of the minute details of the ecosystem of the place visited. This way, the text and the environment are mutually embedded in each other. A nature-text, according to this scheme, is created only if an author has first-hand experience of a particular natural environment and writes about his/her experience, usually in the form of non-fiction. The fourth important participant in the making of a nature-text is the reader. The nature-text works better if the reader, too, has had a first-hand experience of the natural environment that is represented in the written text. In addition to a familiarity with the environment, s/he should also know the genre conventions related to a non-fictional nature essay (nature writing). In Estonian culture, it is often the case that a reader also knows the writer, either personally (by having been hiking in the same areas, for example) or as a public media figure (like Fred Jüssi or Jaan Tätte). In this way, the author's position and activities beyond the text of nature writing contribute an extra layer to the nature-text and to the reader's interpretation of it. A nature-text only works properly when all of its four components are included in the process of interpretation in an interrelated manner.

As Maran points out, contextuality is one of the central characteristics of nature writing (Maran 2007a: 273). That is, connotative meanings play an important role in the interpretation process. In fiction studies, reading a work of literature against the background of its immediate environment of writing is not considered to be of primary importance for understanding it. Such a necessity may arise only occasionally, especially if an evident discrepancy occurs between the text and the environment it refers to. Only when the text reaches people who have a personal experience of the landscape may they notice the misplaced representation of nature that is based on a "falsely believed" assumption by the author, as well as by her earlier readers. The representations based on the actual natural environment play an important role not only in nature writing but also in fiction. In regard to connotative meanings and regarding the readers' perceptions of what is a truthful representation and what is not, it should be noted that quite often cultural conventions play their role in conditioning the perception. It is not always denotative aptness that makes a representation viable; it may also be the connotative adherence to the cultural norms of representation, and the reader's ability to recognise these.

As Maran (2007a: 271) has noted, both semiotics and ecology rely on research methods that are grounded in contextuality: each individual phenomenon acquires significance in the context where it functionally belongs. Semiotic analysis as such must take into account the contextuality of any communication act, including written communication in an elaborate form, i.e. literary creation.

A literary work makes use of the external world in a similar manner as non-fiction. Representations of the environment in written text make sense insofar as we are able to relate these to our personal experiences as readers.

It is instructive to take Fred Jüssi's piece of nature writing entitled "Sounds" (Jüssi 1986: 27–28)[1] and analyse it as a nature-text. This should give an idea of the multi-faceted nature of nature representations in a literary text, and also show that nature writing is by no means a "simpler" object for critical studies than a piece of fiction.

Jüssi's text is set on an islet in the Baltic Sea. The time frame for the piece is an evening in early spring. The year of writing, 1976, is added to the text. The author observes the sounds and activities of several bird species: goosanders, long-tailed ducks, swans, mallards, eiders, goldeneyes, and a blackbird. Two thoughts concerning the specifically human umwelt are woven into the discussion of the birds' audible activities: one about the tacit knowledge of coastal people, and another one about the sense of longing for home that the sound of a goldeneye's wingbeat may elicit. That is more or less all the information that we can obtain from the text itself. In order to understand the poetics of the text more deeply, contextual information is needed.

Let's start with the location. The name of the islet is not mentioned in the text. The only geographical reference is encountered in the middle section of the essay, "Swans are trumpeting in Õunaku bay". Õunaku is a small bay on the southeastern coast of Hiiumaa island. It is lined by a number of islets belonging to Moonsund Archipelago, but the one that Jüssi is standing on in that particular occasion must be Saarnaki. Its location is suitable for observing all the bird species mentioned in the text. Swans prefer to linger near shores when resting where they are able to grasp food from the seabed in shallow water. A personal experience of visiting these islets also helps to determine the possible physical and auditive landscapes – Hanikatsi is too far off in the sea for a human to be able to hear the swans near the shore in Õunaku bay (see Fig 2).

[1] Excerpts from the same text were used as a source for the semiotic study of sound representations in the article "Bird sounds in nature writing" by the author of the current chapter (see Tüür 2009).

Figure 2. Map of Õunaku bay (Source: Estonian Land Board).

Hanikatsi is the only possible alternative to Saarnaki as the location of the piece. A well and a house, referring to permanent human habitation, and connected with a footpath that, in turn, indicates recent and regular use, are mentioned: the writer describes his brief halt on his way from the house to the well to fetch water. Of the smaller islets around Õunaku bay, only Saarnaki (1564–1973) and Hanikatsi (1623–1965) have had permanent inhabitation, including farmhouses.[2] Information about the inhabitation of the islets can be obtained from old maps and archival documents, as well as from other books of nature writing (Rebassoo 1972; Leito 1984). The well of Saarnaki has also been mentioned as an important element of the islescape by Tiit Leito, a nature writer and a long-time head of the islets' nature reserve. Leito writes in his book "Four Seasons on the Islets" that the inhabitants of Saarnaki could tell the approaching winter by observing their well: when it filled up with water to its upper rim, ice and snow were about to arrive (Leito 1984: 5).

Also Jüssi's passage about the environmental wisdom of coastal people as contrasted with the atomic, factual knowledge of scientists can be associated with the former inhabitants of the islet. As we can infer from the dates mentioned above, Jüssi wrote his piece at a time when a centuries-long epoch of permanent human habitation on the small islets in the Baltic Sea had just come to its end. Three years prior to writing "Sounds", the last man who lived on Saarnaki, Peeter

[2] Information for the visitors of the Hiiumaa islet protection area (in Estonian): http://www.keskkonnaamet.ee/hiiu/kulastajale/kultuuriparand (21.11.2015).

Saarnak, had drowned in a rowing boat accident on the stormy sea because Soviet authorities had banned the usage of motor boats and sailboats by coastal people (Klaas 2007: 7). Thus the reference to the vanishing wisdom of coastal people in this piece indirectly served as a comment about the political regulations that devastated the local life.

The text reveals that Jüssi and his companions have arrived at the islet with the aim of setting up nesting boxes for goosanders. This is another minute but important detail that helps to determine the location. It cannot be found in written sources but only by a personal observation on the islets – on Hanikatsi, the nests for goosanders have been established in hollow trees instead of nest boxes. The described activity is a manifestation of an effort to keep up the ancient practices of coastal folks. Collecting waterfowl eggs to enrich one's diet in spring is a practice that has been known to all Finno-Ugric people, and that thus has to be a vernacular habit thousands of years old (Mäger 1994: 274). However, the people who have set out to place the nest boxes in "Sounds" are modern scientists, not traditional dwellers, and thus their activities on the islet can be regarded as a nostalgic attempt to re-enact the past. The result is but a copy of the vanishing world with no practical purpose. As Leito later states about their maintenance activities on Saarnaki in a very self-critical manner,

> We pitied the dilapidating houses on Saarnaki and so we decided to restore them. We made new roofs, patched the walls, set in doors and windows, cleaned the well and even mowed the yards. Now, looking at the windows with no glow inside, I can't get rid of the feeling that I am standing among pieces of taxidermy. Yes, we did our best to make everything beautiful, but we could not provide the most important – the living soul. (Leito 1984: 26)

The time frame for the piece could be estimated to last about 5 minutes. On a crisp March/April evening, the average temperature is around 3 degrees C, and even colder in coastal areas where the sea cools off the land more quickly.[3] On the basis of years-long personal experience, I can say that standing still for 5 minutes in such conditions is quite enough, even if the observations of bird behaviour are as thrilling as they get. Stopping on the way to the well also hints that the author most probably stepped out of the house *ad hoc*, with no cap or gloves, and the chill would catch him quickly. No bodily sensations of the author are directly mentioned in this particular text, although they have been rendered elsewhere in his work.

We can also determine the time and the weather conditions at the time of writing the text on the basis of the bird behaviour that is mentioned. Goosanders start nesting shortly after the breaking up of ice (Renno 1993: 53). Swans, according to the Collins bird guide, withstand the rather harsh conditions "closely following

[3] See the observation records at http://seire.keskkonnainfo.ee/.

[the] retreat of ice in spring" in their migration (Collins 2001: 38), arriving in Estonia in March (Renno 1993: 37). As we learn from the text, the swans had migrated in the beginning of March (i.e. the ice would have to break also around that time). Therefore, it is probable that the piece had been written at the end of March, 1976. Leito (1984: 19) writes that April makes the sea ice unreliable, but as Jüssi remarks in his text that the ice had retreated extraordinarily early that year, the time can be settled to March. The appearance of the blackbird confirms this opinion: according to Collins, the Northern European population of blackbirds is migratory, returning from Western Europe usually in March or April (Collins 2001: 276). The blackbird is referred to as a 'forest bird', in contrast to the waterfowl whose sounds have been observed earlier. There are some big ash trees around the houses on Saarnaki, and there is a remarkable group of lindens in the middle of the islet. It is true that the habitat of the blackbird is cardinally different from that of the waterfowl.

Another contrast between the blackbird and the waterfowl lies in the intensity of their sound-making: whereas the blackbird's call is clearly territorial, the previously noted sounds are just part of the birds' movement (such as swishing and splashing) or are used to keep the flock together (such as the trumpeting and owdelee-sounds). The blackbird is characterised as a noisy bird, and its call is described as "a series of metallic, high 'pli-pli-pli-pli-pli-...', which [...] turn into a crescendo" (Collins 2001: 276) which the bird often emits prior to going to roost. In the text, it is as if the blackbird's sound intrudes the islet soundscape where the human listener is immersed, abruptly ending the brief moment of contemplation among the less intrusive sounds from the sea. Such contrast is without a doubt an essential part of the artistic composition of the essay; it starts out smoothly, meditatively, and comes to a sudden end. To take the parallel even further, the text's composition can also be interpreted as a metaphorical parallel to the human history on the islet: it has begun slowly, in close association with the sea, and it suddenly ends because of intense, land-bound regulations.

In conclusion, what we can see on the basis of this brief analysis of the piece of nature writing as a nature-text is that the text itself, its composition, and its natural and historical context make an intrinsically interwoven complex of meanings. In order to understand it, both denotative and connotative meanings have to be taken into account. In the case of a nature-text, connotative meanings are of primary importance: knowledge about the history of the islet's inhabitation by humans helps us to understand better the disposition of the story, as well as the possible meanings and emotional weight of the human actions referred to in it. Connotative meanings help us to specify the location and the time frame – and also the possible climatic conditions and the circumstances of writing, as well as of the real event that the story is based upon. Contextualisation opens up whole new vistas of interpretation for a reader who is him- or herself engaged in the formation of the particular nature-text. Moreover, the personal experiences

of the writer, as well as of the reader, and the implicit intertextual references to the works of other authors with similar experiences from the same area help remarkably in detecting the hidden layers of meaning. In the case of nature writing, the verbal text and the natural-cultural environment it represents evolve as a representational complex. A successful interpretation of such a hybrid object requires knowledge of both from the reader. Part of the knowledge can indeed be obtained by visiting the described places and getting familiar with their natural features and inhabitants, either prior to or after reading a piece of nature writing about that particular location.

3. Overlapping umwelten

In the present sub-chapter, umwelt analysis is applied from the three basic methodological approaches in zoosemiotic research, as outlined in chapter 2. In the case of nature writing, instances of biocommunication and evidence about spatial organisation of some species may also occur, but the most fruitful approach in analysing the textual representations of animals still proves to be umwelt analysis. According to the definition derived on the basis of the works of Jakob von Uexküll, an umwelt is composed of all the meaning relations in the perception-based and in the action-based functional circles of an animal. In order to be able to render another species' umwelt in writing, a human observer must have at least partly the same perceptual capacities that the animal has, as well as some knowledge of the underlying biology that helps us to create a contact zone between different species. It must be kept in mind that the contact zone is not necessarily mutual in all cases, and not necessarily in favour of the human counterpart, either. In the course of an encounter, the observer's and the observee's umwelten usually overlap to a degree – that is, they perceive each other and often even establish a contact that is meaningful for all the engaged parties.

Knowledge of the structure of the umwelten of the other living beings, who are part of a piece of nature writing, is connected with the denotative meanings of the nature-text. In order to be able to estimate how the specific traits of other animals' umwelten are represented in the text, what features have been emphasised, and what features have deliberately been left unaddressed, we must have some denotative knowledge of the basic biology of the species that we encounter in a nature-text.

In order to be more precise in estimating the nature of the inter-species' contacts, it is necessary to make a distinction between communication and signification (Martinelli 2007: 28). The former describes a situation where there is an intentional sender involved, and both sender and receiver share a considerable amount of the principles determining the form, the rules of codification, and the context of the messages. This sort of interaction is usual in intraspecific communication,

such as human language. In the case of signification, the semiosis resembles the way the inanimate environment is interpreted by a living creature (Maran 2007b: 42; Nöth 2001: 72). In nature writing, instances of communication as well as of signification can be found in the descriptions of human encounters with other animals. Making a distinction between communication and signification may be subject to interpretations and intentions of the receiver to a considerable degree. For example, if a representative of another species is not vitally interested in its human observers, it may happen that it has no intention for any interaction with humans whatsoever.

However, humans easily tend to interpret natural phenomena as symbolic communication on one hand or, on the other extreme, as unintentional signals resembling the ones present in inanimate nature. This raises a load of ethical questions regarding the proper relationship of humans with other species. What are the consequences if an animal's behaviour elicits exaggerated or even inadequate reactions in the human umwelt? For example, misinterpretation of a "cute" little animal, such as a colourful but poisonous frog, may be dangerous or even lethal to either of the participants in such communication instances. There are not many descriptions of such misguided communication in Estonian nature writing, but the potential for such events is implicitly there. Jüssi describes an encounter with a field mouse in one of his texts:

> Then comes a mouse. It has slipped in from some crack in the wall, it has climbed on the table, and it is now munching away with my bread in the full peace of mind. It pays no heed to me. When I touch the silky fur on the back of the mouse with my finger, it rises to its hind paws and sniffs my hand. I have a somewhat uneasy feeling – my fingertips smell of smoky lard and pine sap, and how do I know that it is not about to have a bite of me with its needle-sharp little teeth? (Jüssi 1986: 41)

Here the connection between a human and a mouse is established on the basis of one of the most inevitable needs in all animals – the need for food. The olfactory aspects of the contact are also shared, although the author hesitates about the possible semantic connotations the smells may have in the mouse's umwelt, and about what action they may elicit in it. The third layer where the human and animal umwelten overlap is the realm of tactile sensations: the mouse feels and reacts to the human touch, even though this may seem an inadequate reaction, as we are stereotypically used to thinking of wild animals as having a fear and flight reaction to human presence. Therefore, the human also anticipates the mouse's touch and thinks of the little creature's teeth as the organ of encounter – thus, in turn, fastening the stereotypical perception of any wild animal as having dangerous teeth, by which it makes its contacts with the rest of the world. In addition to knowledge of animal biology, a number of connotative, culture-induced ideas seep through the textual tissue. We may thus conclude that human

interpretation of animal umwelten is inevitably marked by our human symbolic capacities, by cultural connotative meanings, and by the tendency to interpret encounters with other species as necessarily communicative situations.

Uexküll has shown that thanks to the functional cycle in animal umwelten, animals are generally able to move away from the conditions that are not suitable for their life at a considerable speed, picking the direction of movement more or less at will. They can also actively seek to alter the environment or its features in order to make them more suitable for their life needs. Even if the alterations in the environment are minor, they can be perceived as huge by some other species. For example, beavers construct dams on streams and rivulets in order to have dens and favourable feeding conditions. Humans may perceive this as a drastic and infavourable intrusion into the landscape, as the life-related activities of beavers result in floods, in irrigation or amelioration ditches being stuck and growing over with bush, in the decreasing of fish in streams, and so on. Then verbal representations (including nature writing) of beavers and their activities come to play an important role in how such different interests of the species with overlapping umwelten are perceived, represented, and negotiated.

We have different possibilities for rendering the animal's perspective in verbal representations – as this way of mediating the environment is something alien to species other than humans. One option is to anthropomorphise the animals: to represent them as if talking to each other, reasoning about their behaviour; to depict them having emotions similar to those of humans, such as love, rage, fear, attachment; etc. Such an approach often results in children's stories that have been criticised for their low level of sensitivity towards the genuinely species-specific umwelt. The other option is to try to explain the animals' behaviour, relying strictly on scientific data about animal ecology, ethology, and zoology. It requires special skill to convert the quantitative data obtained by the methods of hard science into an eloquent story that the readers would be keen to follow until its end.

The connecting point that ties together humans' and other animals' umwelten is indeed the life cycle: each individual is born (or hatched), it matures, moves about, mates, produces some offspring, and finally dies. All of these stages of life are observable in most vertebrates, thus providing a nice common ground for drawing affective parallels between the lives of different species. Kinship relations and life cycles are universally present across species, providing a "natural" structural basis for nature writing that features animals and animal lives. Thus it can be claimed that animal representations based on a featured animal's life cycle are relatively easily accessible to human readers who can in this way find similarities with their own umwelt. This fosters sympathy towards other species, which is indeed one of the aims of nature writing, along with giving information about our fellow species' lives, as they might see it themselves.

The life cycles of humans and other animals are organised in a syntactically similar manner – i.e., the sequence of life episodes is more or less the same across a wide range of species. This fact gives us reason to make a brief excurse into the phenomenon of biotranslation here. The notion of bio-translation has been outlined by Kalevi Kull and Peeter Torop (2003) in order to analyse the different translation mechanisms that may occur in literary texts, and to take into account the possible instances of translation between umwelten. In their article, Kull and Torop bring examples mostly from molecular level and from the translation mechanisms that occur in DNA. It is challenging to think about whether, and in what conditions, inter-species communication could be regarded as biotranslation. We can differentiate between three types of translation: 1) linguistic translation, or a translation from one verbal language to another; 2) intersemiotic translation, e.g. in combining verbal text and photographs that are mutually complementary; 3) biotranslation, when the umwelt of another species is mediated to human readers in the form of literature or any other communication type characteristic of the human species.

As Kull and Torop explain, translation requires two distinguishable sign systems and a successful transmission of meaning from one to the other. Biotranslation could thus be regarded as a transmission between umwelten. In the case of a regular translation, we can speak of the structure of the text, of its poetic function, and of the syntax as one of its constituting values. Kull and Torop argue in their article that for other animals, certain rhythmically repeated patterns of movement may serve as proto-syntax. Thus translation of an animal's life events into a human narrative also emerges as a technical, as well as semiotic, problem: could we say that representing an animal's life cycle by human means, such as literature, sound recording, or film, is bio-translation? This question is intriguing, but the discussion would require a separate article, and must therefore remain only noted here. The present article and the umwelt analysis presented in the following serve as a preparation towards a more elaborate study of the question of biotranslation in the future.

We as humans, especially in our written communication, cannot deny our perspective outside the limits of the umwelt of our own species: we always perceive and conceptualise the world around us as the representatives of the human species. Literary representation, however, enables us to create possible worlds and to position ourselves as if in other umwelten, without actually having to shapeshift. This is indeed one of the indisputable strengths of verbal representation. In comparison to photographic representation that inevitably features the technologically mediated human gaze, nature writing may be able to conceal the human subjectivity by bringing to the fore the features defining the umwelt of the "target species". A story can be narrated from the point of view of another species, or it can be narrated neutrally, describing the life events of some representatives of other species as if from the point of view of an outside observer.

Employing the point of view of an omniscient narrator is also a possibility. All of these choices have been used in the tradition of nature writing, both Estonian and international.

In order to see how the overlappings of human and bird umwelten have been used in Estonian nature writing, let us turn to Fred Jüssi's piece "Sounds" as the model source again. The title suggests that the piece focuses on soundscapes and on auditive sensations. These are described as experienced by the author while standing outside of a house on a small islet on the Moonsund Archipelago. It is early spring, and a number of waterfowl and migratory birds are audially observed. When people tell about their encounters with birds, these tend to be visual experiences. Visual perception dominates other senses that bring our brains information from the environment. Focusing on sounds in the present text is a manifest shift to another perception channel, thus perhaps even creating some sense of unfamiliarity in readers. For birds of many species, auditive communication is much more important than the visual. By choosing to focus on sounds, Jüssi steps out of his own human 'comfort zone' and moves closer to the umwelt of birds for whom sound-based communication is of vital importance. The first sound that the text mentions is the distant call of long-tailed ducks in a vernacular verbal rendering: "Aa au-li, aa au-li" (Jüssi 1986: 27) or "Ow ow-owdelee, ow ow-owdelee" in translation (as rendered in Collins 2001: 64). This call has been poeticised in several Estonian literary works. A distant and nice sounding call from the open seas easily reaches the position of a symbol. In "Sounds", it is followed by an explanation: "The long-tailed ducks are migrating". This shifts focus to birds and directs the thoughts of the reader to the situation of migrating and to its possible meanings in the birds' umwelt. It does not yet suggest that the sound has symbolic qualities for the human listener, but it prepares the reader for the passage towards the end of the text, which is about the "sound of longing" created by the swishing sound of male goldeneye's wings.

The verb used to characterise the sound of swans in the Estonian text, "pasundavad", is not exactly the most poetic word one could think of (and thus is hard to translate, even though "whooping" is a taxonomically correct choice). It suggests a loud, blaring and slightly annoying sound to the human ear. The loud sounds of a flock are contrasted to a lone pair of whooper swans, "quietly minding their own business" by the shore. However, the importance of sound in flock behaviour is recognised.

Jüssi also discusses the call of male eiders. In the story, that call is missing, thus acting as a zero sign in Sebeok's sense (1994: 18) – that is, signifying by its very absence. As the author admits that he does not know whether male eiders would utter the call in the evening or not, he indicates that his knowledge of bird behaviour and about the place of certain sounds in an eider's umwelt is not without certain gaps. Still, the distinction between flock calls and mate calls, as well as the territorial call of the blackbird at the end of the text, show that the

author has remarkable knowledge of the possible repertoire of bird sounds and that he can associate them with different modes of behaviour. Humans, too, use different sounds and verbalisations for analogous functions: to keep a group together and to express solidarity, to bond with their family members, and to declare one's territorial rights. In addition to sounds, humans have a number of other very elaborate sign systems for the same functions, for example banners, coats of arms, border demarcations and military equipment for the expression of one's territoriality. The sign systems used are different, but the basic needs – social, individual, territorial – are shared across umwelten.

Jüssi mentions the holes dug into the coastal mud by swans in search of food. This observation requires knowledge about waterbird biology and their feeding habits; otherwise the holes in the mud would remain cryptic signs. Although the author himself does not share this food searching strategy with swans, he is able to recognise and relate to it. Here the overlapping of umwelten does not happen on the processual level of the food search, but rather on the general level – all species must eat. That connects humans to swans and to other waterfowl quite effectively. This example can also be conceptualised as an instance enabling biotranslation: it is an inevitable function of life that is not missing from any vertebrate umwelt (things may be different in the case of some insects that pass metamorphic stages during their life cycle).

At the end of the piece, it is the territorial call of a blackbird that serves as a discrepant sound and awakes the human listener from his reveries. To tell the difference between the sounds of waterfowl and the call of a forest bird requires some denotative knowledge. For an ornithologically ignorant listener or reader, 'bird sounds' may be all the same. Here, Jüssi juxtaposes the sounds of water birds with the call of a song bird and, as a result, is brought back by surprise to his own umwelt and to the meaningful behaviour valued in the human world: "Right, I was on my way to the well to fetch water...!" The activities performed in the umwelten of different species may serve different purposes, but the analysis hopefully managed to demonstrate that there are overlappings and contact zones in the umwelten of different species that enable us to relate to each other over the limits of species. Stereotypical perceptions possessed by humans may indeed hinder the mutual communication, but nature writing at its best suggests that we are able to overcome this. Semiotic analysis of nature writing contributes to the creation of this understanding.

Conclusion

The present chapter focused on animal representations in nature writing and on their analysis with the help of tools provided by the semiotic approach. 'Representation' is a notion that is often used but seldom conceptualised. Here representations are understood as non-human environments and umwelten

that are perceived from within a human umwelt and rendered by means of sign systems that are available for humans' intra-specific communication, such as literature, film, and photo. Unlike in fiction, the reality that is modelled into a cultural text plays an important role in understanding these texts. Therefore, we can say that nature writing is a hybrid object: it extends beyond the scope of one individual discipline, such as literary criticism or biology studies, and challenges their limits. Semiotic methodology provides help in overcoming this tension. It suggests looking at nature writing as a communicative device that functions between humans in our species' umwelt, and that also gives us insights into the umwelten of other animals. By regarding nature writing as involving a nature-text that brings together the denotative and connotative knowledge about the represented reality and species, a semiotic approach provides tools for analysing it in a systematic manner. The central notion in the biosemiotic analysis of nature writing is definitely umwelt – the species-specific way of perceiving the environment and of relating to it through actions. When the umwelten of different species overlap, a contact zone is created and a possibility for meaningful communication and perhaps even for bio-translation arises.

Human texts and our perceptions based on them affect real animals, and therefore we should be careful in producing nature writing as well as in our critical examination of nature writing. Jüssi's writings are a good example that a wide array of non-human species can be represented not only by rendering their umwelten correctly, but also in a cordial manner.

Acknowledgements

The research for this chapter was supported by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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Environmental Board – keskkonnaamet.ee

Environmental Monitoring Board – seire.keskkonnainfo.ee

Appendix

Sounds

Fred Jüssi

I stop on my way to the well to listen to what the spring sea has to tell.

It is evening, the sun has just set. The sea fell quiet a few of hours ago, and in the light of dusk only a soft ripple is visible on its surface. The wind is about to turn, it seems.

I haven't been to the islets this early in the spring before. At this time of the year the sea is usually still full of ice, but this year it is different. Yesterday we launched the boat, and today we are already on an islet to put up new nesting boxes for goosanders. And now it is evening and from the sea the sounds of the birds waft my path to the well.

Ow ow-owdelee, ow ow-owdelee. The long-tailed ducks are migrating. There are many of them on the sea. Earlier during the day they flew off in flocks at the approaching boat, but the time of massive migration is still ahead.

Swans are whooping in Õunaku bay. The swans came and left at the beginning of March, there are only a few of them now. When sea water was low, I went to the shore to see their stopover sites. The mud was full of smaller and bigger holes, which the swans had hollowed there in search for food. Right here on the coast there's a pair of whooper swans at the moment, but making no sound – they are quietly minding their own business.

Mallards quack and splash about by the reed bed. No sound of a male eider. I can't recall if I have ever heard a male eider's call in the evening at all. In the morning, and during the daytime, yes, but not in the evening. I don't remember. I should remember to try and listen to it in the future. In a sense, fishermen have a much better knowledge of the sea than biologists. They have more observations. A researcher notes an observation and then looks it up in the notebook if necessary. Coastal folks do not walk around with notebooks and binoculars, but if you have a question, they rummage out their wisdom in response. This wisdom has seeped into them over the years lived on the sea and at the seashore, and is always close at hand.

With their wings whistling, a small flock of goldeneyes flies across the islet. Here one gets used to the whistling of the goldeneyes, one no longer notices it, but in the inland woods and moors it is one of the most beautiful sounds in a springtime night. While the scream of a fox in a February night makes one feel like responding to the call, the whistling of goldeneye wings conceals the haste of someone driven by a longing for home. At least that is how it has seemed to me during nights spent in the woods by the campfire.

All of a sudden, a blackbird starts singing in an ash tree behind the house. The voice of a forest bird wakes me from my thoughts. Right, I was on my way to the well to fetch water...!

Semiotic modelling of biological mimicry

Timo Maran

In recent decades, biosemiotics (with the subfields of zoosemiotics and ecosemiotics) has established itself as an independent research paradigm with a conceptual framework, a professional association, conferences and a thematic publication series. The question still unsettled is to what extent a semiotic approach can be productive for different research tasks in biology proper: evolutionary biology, ecology, species protection, etc. The gap between semiotics and biology may be, however, smaller than it seems. Claus Emmeche and Jesper Hoffmeyer (1991) have demonstrated the hidden connection between biology and semiotics as core concepts used in molecular biology are often semiotic by nature. Thomas P. Weber has argued in *Trends in Ecology and Evolution* that a semiotic approach can be beneficial for evolutionary biology in raising new hypotheses (Weber 2000). Semiotic methodology has also been successfully applied in landscape ecology (Farina 2012; Malavasi *et al*. 2014).

In this chapter, I make an attempt to demonstrate how semiotic modelling can be used in systemic analysis of biological mimicry (that is, deceptive systemic resemblance between different species). As the first part of the chapter, I introduce the common conceptual framework of biological mimicry and argue that shortcomings in classical biological approaches could be compensated for by including semiotic analyses. Thereafter I propose a five-stage model of analysis, which incorporates classical mimicry theory and Jakob von Uexküll's umwelt theory, as well as semiotic and communication analysis. This model exemplifies the general methodological approach proposed in this volume, where conceptual tools and methods are brought together for a specific research task in a toolbox-like manner. This proposed research model can be expressed in the form of five questions:

1) What is the formal structure of a mimicry system?
2) What are the perceptual and effectual correspondences between the participants of mimicry?
3) What are the characteristics of resemblances?
4) How is the mimicry system regulated in ontogenetic and evolutionary processes?

5) How is the mimicry system related to human cultural processes?

As a practical application of the research model, two well-known cases of mimicry are compared and analysed: brood parasitism of the common cuckoo and *Lepidopteran* eyespots.

Over the years, a vast number of writings on mimicry has been published in biological literature, most of these being case studies of specific mimicry resemblances. For instance the bibliography of mimetic phenomena compiled by the historian of biology and mimicry specialist Stanislav Komárek exceeds 5000 items (Komárek 2003: 7). However, there are many less systematic accounts of mimicry that aim at providing a comparative and comprehensive overview of different mimicry instances. The few existing mimicry typologies appear to be too static for matching the complexity of actual research. It is more common that the case studies form specific traditions of study by including also many ecological aspects of the observed species. Vivid examples are offered by studies on brood parasitism, mimicry rings in *Heliconius* butterflies or the wasp–hoverfly mimicry complex. The aim of the present article is to propose a methodology based on biosemiotic research methods that would allow a dynamical and comparative description of various mimicry cases. This methodology is exemplified by focusing on specific mimicry types – brood parasitism and eyespots.

My article is grounded on established terminology in which the phenomenon of mimicry is considered to be a tripartite relationship between 1) an imitating organism (the *mimic*); 2) an object of imitation (the *model*); and 3) a deceived or confused organism (the *receiver*) (Wickler 1968: 8–10; Vane-Wright 1976: 28, 30; Pasteur 1982: 171–173). All three parties together form a mimicry system that is a relatively consistent structure in virtue of being regulated by relations amongst the participants. For instance, in the case of protective mimicry where a broad-bordered bee hawk-moth *Hemaris fuciformis* resembles a bumblebee to a European pied flycatcher *Ficedula hypoleuca*, the hawk-moth can be considered the mimic, the bumblebee the model and the flycatcher the receiver. The mimic in the mimicry system is generally considered to gain an evolutionary or behavioural benefit and the receiver mostly to suffer because of the interaction. The position of the model varies depending on the specific mimicry type: in classical Batesian mimicry (where the mimic gains protection through resembling the model), the model suffers because of the mimic's presence, while in aggressive mimicry the model often benefits. This tripartite mimicry model has its roots in the works of a German biologist, Wolfgang Wickler (1965, 1968), and it has greatly improved the comprehension of mimicry by leading to the formalised description of mimicry, by establishing new mimicry types and by creating typological schemas of the mimicry systems (for example, Pasteur 1982; Wiens 1978; Vane-Wright 1976). For semiotics, the main advantage of this kind of threefold model appears to be in highlighting the possibility to analyse mimicry from different perspectives: as a communicative relationship between the model and the receiver, as a

resemblance-based relation between the model and the mimic, and as a deceptive relation between the mimic and the receiver (see Maran 2008: 99–104).[1] At the same time, it seems that the triadic description of mimicry as consisting of the mimic, the model and the receiver also has its serious drawbacks.

1. Critical discussion of the triadic mimicry model

The tripartite model presumes the presence of the relations of resemblance between three participants mostly concretised as species.[2] This actually does not appear to be a very common situation in nature. It is more frequent that one of the three positions of the triad is filled by several species: for instance, the resemblance between the broad-bordered bee hawk-moth and bumblebees can be confusing also to shrike *Lanius* sp. and to several other insectivorous bird groups beside flycatchers. In a similar way, the position of mimics and models can also be filled with more than one species. Furthermore, the number of species that can participate in a mimicry system is in many cases not limited; besides the dominant participating species, there may also be occasional participants (for instance, omnivorous birds, for whom the moths form a small part of their diet and for whom confusing a hawk-moth with a bumblebee is a rare event). In some other cases, the involved species cannot be clearly divided between mimics and models, and the participating species rather form a fuzzy set of resemblances called the Müllerian-Batesian mimicry complex. In such a case, the difference in edibility or dangerousness of the involved species is not clearly established, or it may vary between individuals or develop during their life.

The number of participating species in a mimicry system is not the only problem for the triadic description of mimicry. German theoretical biologists Zabka and Tembrock have argued that in many cases the model is a more general feature or class of objects and in principle cannot be reduced to a single species. This is so, for instance, in the case where decaying meat is mimicked by carrion-flowers to attract flies, which are looking for carcasses to lay their eggs in (Zabka, Tembrock 1986: 172). The same type of phenomenon is described by Georges Pasteur as semi-abstract or abstract homotypy (Pasteur 1982: 191) and by Maran (2007: 239–243) as abstract mimicry, the examples of which cover a wide array of phenomena from eyespots to deimatic displays. In the case of abstract mimicry, the object of imitation appears to be some abstract meaning in nature and its

[1] This chapter is conceptually and terminologically grounded on my previous studies on the semiotics of mimicry (Maran 2007, 2008, 2011).

[2] This does not necessarily mean that there are three species involved in the mimicry system. Quite often two species fill the three roles: for instance, the model and the receiver can belong to the same species, as is usual in aggressive mimicry. Common mimicry typologies also acknowledge such a possibility and include the category of bipartite mimicry systems.

physical expression; for instance, dangerous situations are marked by a sudden change of affairs.

A third source of problems is a possibility that one and the same individual can be simultaneously involved in more than one mimetic resemblance; a combination that can in some cases have structural importance for the mimicry system. For example, in its aggressive mimicry system, the monkfish *Lophius piscatorius* combines a cryptic resemblance of its body surface (mimic) to the seafloor rich in algae and to other plants (model), and the resemblance of its foremost fin ray (mimic) to a worm (model). The first type of resemblance serves to make the monkfish hard to notice, and the second type helps to lure and catch smaller fish (signal-receiver). Both resemblances support each other and are active during the same communicative interaction between the monkfish and its prey species. Such an instance of mimicry cannot be easily accommodated by the classical mimicry triad.

When trying to formalise these examples, it appears that the systemic approach to mimicry has problems in 1) defining the set of elements (species) that belong to the (mimicry) system as a whole; 2) determining the location of elements with regard to predefined classes of mimics, models, and receivers; and 3) the presence of classificatory error, that is, the same element can belong to more than one class, or the same element can belong to more than one system. A partial solution to this problem would be to reconsider the mimicry triad to be a logical and conceptual relationship between three entities and not to take this as a necessarily ecological relationship between three species. In some cases, the involvement of actual species may correspond to the roles in the mimicry triad, but this is not, by any means, an inevitable condition. Another possibility would be to consider the mimicry system as having a double layered structure, consisting of a layer of ecological relations between species and a layer of semiotic sign relations. Species, or more correctly their particular populations, are indeed the actual biological entities that are involved in different ecological relations such as predation, competition, parasitism and others, and their number and evolutionary characteristics can also change because of a particular relation. The second, semiotic layer would include a specific relation of resemblance, in which case we may ask, "What resembles what to whom in what respect?" On this level we are dealing with specific qualities and their similarity in the eyes of a particular beholder.[3] These two layers can combine with each other in many different ways and can produce different types of mimicry systems.

In addition to the rigidness of the triadic system of mimicry, a radical differentiation that is often assumed to exist between mimicry and other adaptations can also become an obstacle for studying various resemblances in nature. Quite often we find in scientific literature arguments in favour of regarding one or

[3] The Danish biosemiotician Jesper Hoffmeyer has described such a semiotic layer accompanying ecological relations as semethic interactions (Hoffmeyer 2008: 189).

another resemblance in nature as mimicry: such arguments thus presuppose that a distinct category of mimicry systems does exist. When we think about many occasional similarities between species and about the previous example of facultative mimicry, then the clear demarcation line between what is mimicry and what is not disappears. This is also supported by the fact that the recognition/misrecognition between mimics and models by the signal-receiver is a probable event and not following any fixed rule. Instead, we should rather talk about a *landscape of mimeticity* in nature or the capability of the natural forms to create confusion.

This discussion is also closely related to the way in which the existence of mimicry systems in nature is argued for and proved. The strongest possible proof for mimicry as an evolutionary phenomenon is the demonstration that the change in some evolutionary agent (animate or inanimate) has caused a specific mimicry adaptation to emerge or proliferate. An example of this kind of strong proof is studies on the abundance of dark-winged moths in Great Britain during the rise of the coal-based economy in the nineteenth century, where the darkening of the visible environment correlates with the amount of melanismic moths (for example, Berry 1990), although even this case has been a subject of dispute. Such strong proofs are, however, more than rare, especially in the face of common claims about mimicry as an evolutionary adaptation *par excellence*. More often the existence of mimicry is argued for by indirect proofs:

1) the correlation between the specifics of the receiver's sensory perception and the resemblance between the mimic and the model;
2) correspondences of the living areas of mimics and models;
3) indications of predatory pressure, such as the relative abundance of the mimic and the model in the diet of a predatory receiver;
4) the location of injury in the mimic's body regarding mimetic features (such as birds' beak marks on butterfly wings);
5) behavioural responses of the receiver to specific appearances of models and mimics (warning colouration);
6) the receiver's ability to learn from unpleasant experiences with models;
7) experiments with the manipulation of mimetic features – for example, painting mimetic features onto a non-mimetic organism or covering up mimetic features, etc.

These various arguments are indirect in the sense that although they demonstrate various correlations between mimics and models or illustrate how an organism benefits from mimetic features, they cannot prove that mimetic features have developed because of the specific relations between models, receivers and mimics. At the farthest end of this scale of validity are cases where human senses are used to determine mimetic relations – if a mimic and a model seem similar to us, a mimicry resemblance is judged to exist. A good illustration of such a connection between human sensed similarity and supposed mimicry resemblance are the

artistic works and academic writings of an American painter and naturalist, Abbott H. Thayer (1909).

Thus, the problem with the perception of mimicry in mainstream biology is two-sided. First, mimicry is often seen as a distinct phenomenon that has definite borders, and second, it is also supposed to be provable as such. Many classical examples of mimicry in nature and also many arguments used to explain these do not, however, correspond to this widespread idea. To alleviate this problem and to bridge the gap between mimicry systems theory and actual case studies, it would be beneficial to have more dynamical descriptions of resemblances in nature that would not take as a prerequisite the existence of mimicry as a clear-cut tripartite system. For providing such tools of description, the biosemiotic approach can turn out to be helpful. This is so first because of structural methodologies that are available in semiotics. Biosemiotics also does not rely on evolutionary functionality as a primary criterion for delimiting research objects, which makes it more responsive to such features of organisms whose advantage to their carriers is not obvious at first sight.

2. Toolbox for modelling mimicry

A wider and semiotics-based methodology, proposed in this chapter, is not strictly grounded on a single theoretical foundation but consists rather of a group of various methods that could be used like a toolbox to approach different types of mimetic resemblances. In building this approach, I have integrated aspects of the classical mimicry theory, of Jakob von Uexküll's umwelt-theory, and of semiotic and communication analysis into a model of five-level analysis. Questions related to the meaning and significance of a deceptive resemblance are not part of these tools, but are rather considered as a part of the initial research hypothesis that is either supported or rejected as an outcome of the analysis.

The first level of analysis departs from the classical tripartite Wicklerian model consisting of a mimic, a model and a receiver. Rather than trying to match this to every mimicry system, I would extend it to a general principle and ask what kind of configurations mimicry could take. For instance, mimetic resemblances in monkfish could be expressed as a compound model that includes one mimic and one receiver but two models: the background of the environment and the movement of a worm-like prey of the fish (see Fig. 1, left). In a similar way, mimics and receivers could also be manifold. The mimetic resemblance of cuckoo bumblebees (subgenus *Psithyrus*) could in most cases be described as a compound model that includes one mimic and one model (a particular bumblebee species) but two receivers: the bumblebee host species (being simultaneously the model and the receiver) and insectivorous birds (see Fig. 1, right). On this level of analysis, it is also possible to distinguish in general terms between mimicry

and other types of resemblances. If it is possible to point out all three parties – a mimic, a model and a receiver, given that the receiver is not a human observer – then the resemblance can be regarded as a mimicry system. If this condition is not met, then some other type of resemblance, such as similarity because of an evolutionary affinity or convergence or some resemblance induced by human cultural description, should be suspected.

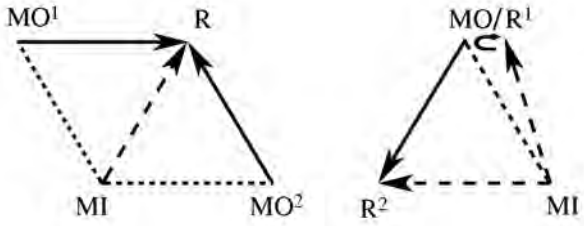

Figure 1. Schematic representation of complex mimicry systems (author's drawing). The unbroken arrow line represents the communicative relation between the model (MO) and the receiver (R) that is exploited by the mimicry system. The dashed arrow line represents the deceptive relation between the mimic (MI) and the model. The dotted line represents the relation of resemblance between the mimic and the model. *Left:* monkfish with two distinct models $MO^{1,2}$ (a worm and the sea bottom). *Right:* cuckoo bumblebee with two distinct receivers $R^{1,2}$ (a bumblebee host and an insectivorous bird, a host R^1 being at the same time also a model MO).

The second level of analysis proceeds from the umwelt theory of Jakob von Uexküll and focuses on the corresponding body structures of the mimic, on the model and the receiver (the properties of the original and the imitated signal), and on the communication channels and the behavioural regulation used (perceptual world *Merkwelt* and operational world *Wirkwelt* in Uexküllian terms). On this level of analysis, a more specific description of the resemblance can be achieved. For example, from a general biological perspective, one can say that in a broad sense the fly orchid *Ophrys insectifera* as a plant is a mimic, but proceeding from Uexküll's theory of umwelt, the similarity between the plant and the female of a particular wasp species is much more specific by being bound only to the outer surface of blossoms (see Maran 2007: 237). The second level of analysis enters the field of qualitative phenomena by describing the specific percepts and activities that are employed in mimicry. Umwelt analysis *sensu* Uexküll (1982: 52–57) can bring out the correspondence or the non-correspondence between the perceptual capabilities of the animal receiver and the body structures of the mimic and the model. This enables us to consider whether the mimic and model are deceptively similar for the receiver, or if they are even perceptible at all. Paying attention to the *Wirkwelt* and the behaviour of the receiver regarding the mimic and the model allows us to make conclusions about the relevance of the resemblance

for the receiver. This is a significant question, as in many cases the deceptive resemblance between two objects does exist for the receiver, but it is irrelevant just like it is irrelevant for an average human to distinguish between bumblebees and the bee hawk-moths that mimic these. By such argumentation, mimicry becomes grounded in the ethological functionality and not in the evolutionary functionality that would be much more difficult to prove.

The third level of analysis proceeds explicitly from semiotics as the study of signs and sign systems and focuses on meaningful units that resemble each other in mimicry. This level of analysis addresses the general conditions that make it possible for a confusion to emerge. A starting point for this discussion is an understanding that resemblance in mimicry is not univalent, but that there are different possibilities for resemblance to occur. First, the resemblance can be described as a matter of degree ranging from non-resemblance to absolute similarity. Also concepts used in psychological studies of categorical perception (such as boundary perception, common characteristics resemblance, prototype resemblance and others) can be employed in distinguishing between various possibilities for a resemblance to emerge. In mimicry studies, three different types of resemblance can be discerned on the basis of Peircean semiotics. This simplest type of resemblance can be described as a relation between one and many, and it is common in camouflage – for instance, when a moth is lying on tree bark. Here the perception of the moth emerges from nowhere, and that allows us to relate camouflage to Peircean firstness. The second type of resemblance is present when we are dealing with deceptive similarity between representatives of two species of which one is eatable and the other poisonous, as is the case of the typical Batesian mimicry. Such a type of mimicry requires comparison, a reference to the second, and seems therefore to relate with Peircean secondness. The third type of mimicry is present, for instance, in the case of eye-marks on the bodies of insects, fish and amphibians, or in the case of colourful patches on the bodies of many lizards and insects. These patches are kept hidden in the normal body position but are flashed during escape. It seems that the unifying aspect of such mimicry systems is a common meaning: thus, for instance, big eyes, unexpected movement or warning colouration all signify something dangerous for the receiver. Such abstract mimicry requires that the meaning of the message is understood by the receiver and seems therefore to relate to thirdness. Besides this kind of distinction based on Peircean categories, mimicry can also be described as fixed or adjustable, partial or complete, local or general, individual or collective, embodied or detached, etc. (for discussion of many of those possibilities, see Pasteur 1982).

The fourth level of analysis proceeds from a cybernetic communication analysis of the mimicry system (Maran 2008: 19–24) by focusing on the position and nature of feedback cycles. Feedback enables dynamics to enter the act of communication, and it also enables the sender to change its behavioural and

communicative activity with respect to the receiver's activity. On the metalevel, feedback in communication allows one to adjust messages and to choose between them, which in the long run enables the development of sign systems. In ecological relations that involve communication, it is possible to distinguish between communicative, ontogenetic and evolutionary levels of feedback regulation (see Maran 2008: 21–22). In communicative feedback, resemblance is regulated within a single act of communication. This is a prevalent regulation mechanism in behavioural and adjustable mimicries, such as the chameleon's changing of colours to correspond to a specific environmental background. Through ontogenetic feedback, an individual's personal experiences are formed or expressed. In phylogenetic or evolutional feedback, genotypic adaptations related to this particular communication act develop or manifest. Distinguishing between different types of resemblance regulation allows us to include among mimicry also such resemblances that are induced by epigenetic memory – for example, by animal cultures where the dependence on genetic causation cannot be proved. This level of analysis helps to focus on dynamical, reversible and individual aspects of mimicry resemblance, such as individual song imitations by many birds (for instance, the European starling *Sturnus vulgaris*).

The fifth level of analysis proceeds from the cultural level and focuses on the observer's perceptual involvement in the mimicry system, as well as on the cultural and scientific status of the phenomenon. This level of analysis deals with the human observer in relation to the mimicry system. The starting point for this discussion is understanding that the umwelten of the human observer and of other living beings participating in a mimicry system are likely to be different. There may well occur situations when the messages of the model and the mimic are situated with respect to the umwelt of the human observer in such a manner that, from the latter's viewpoint, they do not seem similar. For example, the red helleborine *Cephalanthera rubra* and the bellflower *Campanula* sp. are similar to a bee but clearly different to the human eye. Likewise, a whole communication system may be left concealed from the human observer. The location of a deceptive similarity in relation to the umwelt of a human observer may bring about a biased choice of the object to be studied and may lead a nature scholar to under- or over-interpret some mimicry cases.

Besides the relations between an observer's sense organs and a mimicry resemblance, the cultural-historic component of mimicry also needs attention. There are mimicry systems that have a long history of being studied because of the peculiarities of the history of science. For example, mimicry in butterflies is a well-established field partly because of the activity of the nineteenth-century naturalists in collecting insects. A collector's main interest is to identify items correctly. This desire of the naturalists helped to advance systematics but at the same time drew attention to the confusions and ambiguities in nature, including mimicry. In addition, descriptions of mimicry resemblances may also include

cultural, religious or mythological layers. This is related to a historically much earlier search for and interpretation of signs of nature (so called *signatures*) that have been believed to have their origins in a supernormal or divine source. The cultural layer, which remains clearly out of the biologists' scope, can still interest a semiotics that interprets resemblances in nature and in human culture not as distinct fields but as a continuous complex phenomenon. An artificial selection of domestic dogs provides a good example of such a connection, as seen in the human preference for dogs' facial features that resemble human infants has been demonstrated (Hecht, Horowitzb 2015).

3. Comparative analysis of mimicry in brood parasitism and *Lepidoptera* eyespots

In this section, I illustrate the proposed research methodology by analysing two well-known mimicry examples in comparison – the brood parasitism of the common cuckoo *Cuculus canorus* on various passerine host species and *Lepidoptera* eyespots.

Brood parasitism is a very widespread biological phenomenon. It is estimated that approximately 1% of all bird species use some sort of brood parasitism, including nearly half of the 130 species of cuckoos, some cowbirds, indigobirds, whydahs, two genera of finches and some ducks (Payne 1977: 1). Most brood parasites are specialised to specific host species. The common cuckoo has more than 100 potential hosts; the most usual of these include reed warblers (*Acrocephalus*), leaf warblers (*Phylloscopus*) and warblers (*Sylvia*), robin (*Erithacus*), redstarts (*Phoenicurus*), and wagtails (*Motacilla*) (Honza *et al*. 2001: 344, see Fig. 2). In some populations of host species, brood parasitism may affect up to 65% of all nests (Moskát, Honza 2002). Egg mimicry is supported by additional resemblances, as there are correspondences between the behaviour of the cuckoo chicks and the chicks of the particular host species (for example Kilner *et al*. 1999) and similarities in the appearance of the adult cuckoo and hawk species (Payne 1977: 8).

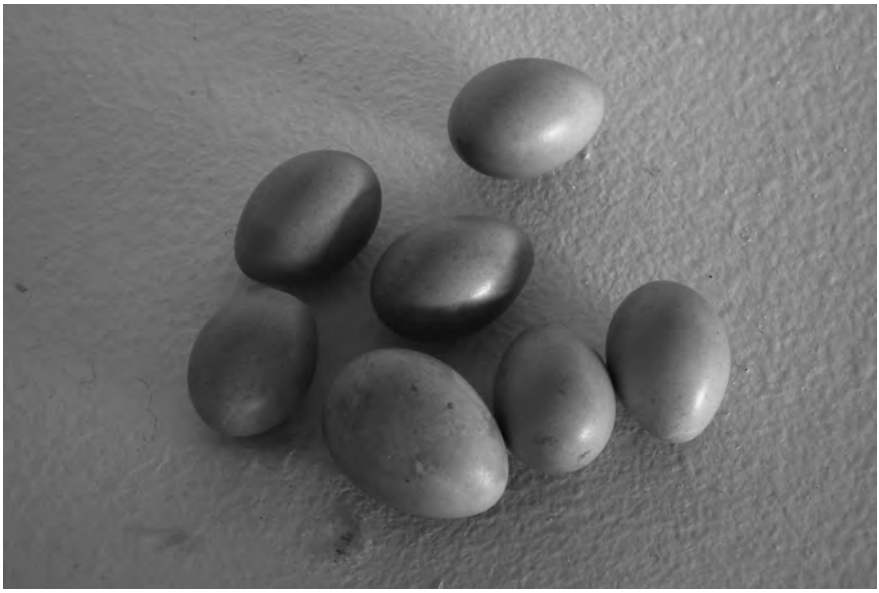

Figure 2. An egg of a common cuckoo in a clutch of a common redstart *Phoenicurus phoenicurus* (collection of the Natural History Museum of the University of Tartu, the author's photo).

Eyespots are a common feature in animal visual communication systems, found in almost all kinds of ecosystems. These iconic signs (i.e. signs based on resemblance) occupy the bodies of organisms living today as well as of those that were fossilised long before mammals first appeared. In butterflies and moths, eyespots are most common and best studied in *Nymphalidae* but exist widely also in other families (e.g. *Saturniidae*, *Sphingidae*). The common understanding of the function of the eyespots is the "intimidation" hypothesis, according to which the function of the eyes is to deter predators and prevent an attack. The usual reasoning here is that eyespots intimidate predators because they represent an imitation of vertebrate eyes: this is the "eye mimicry" hypothesis (Blest 1958, see discussion in Kleisner, Maran 2014). Eyespots have yet other functions, such as playing a signalling role in sexual selection. In the butterfly *Bicyclus anynana* (Nymphalidae), for instance, the dorsal wing pattern is supposed to play a role in female mate choice, whereas the ventral pattern serves a camouflaging and/or predator-deflecting role (Brakefield and Reitsma 1991; Stevens 2005).

The two common mimicry systems – egg mimicry of the common cuckoo and eyespots mimicry in *Lepidoptera* – could be compared using the methodology proposed above (table 1, figure 3). Here I rely mostly on formal comparison; a more detailed discussion on brood parasitism as a mimicry system can be found in Maran 2010.

Table 1. Comparative analysis of mimicry in brood parasitism (*Cuculus canorus*) and Lepidopteran eyespots.

	Brood parasitism	*Lepidoptera eyespots*
1. The formal structure of the mimicry system (see figure 2)	Bilateral mimicry system (model and the receiver belong to the same species) with the reproductive function.	Tripartite mimicry system with a protective function.
2. Perceptual and effectual correspondences between the participants	Detached mimicry (imitating and imitated objects are distinct from the bodies of the participating animals) operating mainly through the visual channel. Mimicry has a high relevance for the receiver as it has developed specific behavioural reactions (puncturing the egg, abandoning the nest).	Operating mainly through the visual channel. Mimicry system takes advantage of the dynamical and quick communication between the predators and prey. Receiver's reactions are much different in regard to whether the sender is recognised as model or mimic.
3. Characteristics of resemblances	Prototype resemblance or common characteristic resemblance. Objects compared are physically together and mimicry is complete (resemblance covers most aspects of a single object).	Prototype resemblance or common characteristic resemblance with some inclination towards abstract mimicry (model is diverse or unspecified). Objects compared are detached from each-other and comparison must rely on the memory of the receiver.
4. Regulation in ontogenetic and evolutionary processes	Mostly genetically induced and controlled with some regulation via ontogenetic learning and feedback.	Mostly genetically induced and controlled with some regulation via ontogenetic learning and feedback.
5. Relation to human cultural processes	Accessible in human umwelt. Larger cultural mythological background is present for interpreting brood parasitism (changelings); common cuckoo acts as a cultural model for describing other parasitic relations (cuckoo bumblebees, cuckoo finches).	Accessible in human umwelt. Eyes are conspicuous structures (semantic organs) for humans and other species. At the same time, there are no well-known general cultural narratives in regard to eyes and eyespots.

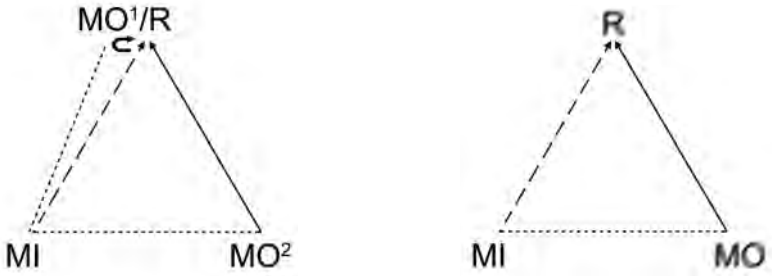

Figure 3. Schematic representation of the analysed mimicry systems (author's drawing). *Left.* Common cuckoo's (MI) mimicry system, cuckoos' host species (MO1) and hawks (MO2) act as models. The unbroken arrow lines represent the communicative relation between the model (MO) and the receiver (R) that is exploited by the mimicry system (circular arrow represents autocommunication in the host species). The dashed arrow line represents the deceptive relation between the mimic (MI) and the receiver. The dotted line represents the relation of resemblance between the mimic and the model. *Right*. Mimicry system of the Lepidopteran eyespots, where a butterfly species acts as mimic (MI), taking advantage of the communicative relation between owls and small carnivorous mammals (MO) and small insectivorous birds (R). Note that from the perspective of the mimic, both Model and Receiver are not specific species, but rather abstract groups (and therefore blurred in the graph).

Discussion. There are both considerable similarities and differences between the mimicry in brood parasitism and *Lepidopteran* eyespots. Both mimicry systems operate on the basis of visual communication (2, 5) and are thus accessible in the human umwelt. This proliferates human interest towards these mimicry systems but, at the same time, lays the ground for over-interpretation (this should be especially taken into account in the case of brood parasitism, which is also a common cultural narrative). The regulation in both mimicry systems are similar (3, 4), relying mostly on genetic processes on the population/species scale with some input from individual learning and recognition. In the case of brood parasitism (1, 2), the combination of species involved is much more delimited, and participants' behavioural reactions are more emphasised and decisive.

From the semiotic perspective, essential differences between two mimicry systems (2, 3) can be pinpointed: egg mimicry in brood parasitism is detached (imitating and imitated objects are distinct from the bodies of the participating animals), comparable (objects compared are physically together), and complete (resemblance covers most aspects of a singular object). This creates preconditions for fine-tuning mimetic resemblance, recognition mechanisms and behavioural responses, of which many examples are known (for example, throwing out eggs that are bigger than eggs in the clutch are on average, Marchetti 2000). Lepidoptera eyespot mimicry, on the other hand, is an open mimicry system (1, 2, 3) that takes

advantage of the quick communication between winged organisms, and it relies on the receivers' recognition capacity, memory and perception of the image of the eye. Eyespot mimicry is much less dependent on the specific receiver species (as there are many of these involved), but rather floats in the resemblances and meanings shared between the inhabitants of the biological community (cf. the concept of "ecological code", Maran 2012). The eyespot mimicry system could potentially be considered an open mimicry system (different from brood parasitism) that can easily incorporate new species and images. The analysis confirms that both mimicry systems are indeed well-established and complex in the natural world. It further demonstrates that although both resemblances operate in the visual communication system and have basically the same group – small song birds – functioning as a receiver, the ecological and semiotic characteristics of the mimicry systems under observation are very different.

Conclusions

The present article develops a semiotic methodology for analysing mimicry systems, while recognising the limitations of the existing mimicry typologies and attempting to avoid these. Using a selection of dynamical tools for describing mimicry allows us to bring forth peculiarities of specific mimicry types and also to compare different cases of mimicry with each other. The semiotic approach developed here has several advantages that also find use in practical analysis. The methodology emphasises the role of perception in mimicry studies, thereby bridging evolutionary and psychological approaches. The five stages of analysis exemplify different strategies of argumentation and verification of mimicry resemblances, allowing us to construct a range from just-so stories to well-established coevolutionary adaptations.

Acknowledgements

An earlier and considerably different version of this chapter has been published as Maran 2010. Published with permissions. The research has been supported by the European Union through the European Regional Development Fund (Centre of Excellence CECT, Estonia) by Estonian Science Foundation Grant No 7790 and by the Norwegian–Estonian Research Cooperation Programme grant EMP151 "Animals in changing environments: Cultural mediation and semiotic analysis".

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Semiotics in the interaction of guide dogs and visually impaired persons

Riin Magnus

The interaction of the guide dog team members, as well as their perception of the environment, are built upon the usage of signs. Hence the semiosic foundation of the team's cooperation could give rich material of analysis for different subfields of semiotics: disability semiotics (see Rogers, Swadener 2001), anthropological zoosemiotics (see Martinelli 2010: 121–170), sociosemiotics and urban semiotics. It also opens up research vistas that until now have gained only minor interest or no attention within semiotic studies: the sensorial complementarity of different individuals and species; the formation of shared meanings between different individuals while carrying out specific tasks; and interspecific communication as a means of introducing new cues and meanings into individual umwelten.

That the differences in the sign usage of different species and individuals are crucial for guide dog work was noticed already in the very early days of guide dog training. Guide dog training started in Germany during WWI. The first guide dogs were trained in Oldenburg in order to aid soldiers who had lost their eyesight (Calabrò 1999: 20–21; Martens 1956: 13). The Institute for Umwelt research in Hamburg, headed by Jakob von Uexküll, started working out training methods for guide dogs in the 1930s (Uexküll, Sarris 1931; see also Magnus 2014a). The method developed by Uexküll and his colleagues was to rely on umwelt theory as a theoretical ground. Jakob von Uexküll had claimed that the umwelt of an animal is inextricably linked with the organism's body plan. Hence, in order to insert meanings and objects that were of importance for the blind person into the umwelt of the dog, the dog's body plan had to be changed. The employees of the Institute for Umwelt research therefore developed a cart, called a 'phantom man', which was meant to imitate a blind person and was attached to the dog. By moving around with the cart, the dog was to discover new meanings of objects (e.g. ditches becoming obstacles from now on) and was hence more independent of the signals of the trainer in the learning process. Although the method is still used in a few guide dog schools, it has never been widespread. Part of the reason is the insensitivity of the method to the activity of the person – s(he) is as if a mere extension of the dog. In the following discussions, the initial premise of Uexküll – that dogs and humans operate with different signs – is retained,

but this will be supplemented by a reflection on the variety of interspecific sign processes upon which the guide dog work is built.

In the following text, the semiotic analysis of the guide dog team's work will be arranged around two lines of investigation: 1) the perception of the two members of the team; 2) communication between the team members and with other human and non-human beings.[1] In addition, semiotic tools could be made good use of when analysing the social reception and representations of the guide dog team, but these topics fall beyond the scope of the current chapter (but see e.g. McHugh 2011). As perceptual and communicative semiosis differ in their constitutive elements as well as in the roles carried by those elements, also slightly different models and concepts are needed for their analysis (see e.g. Uexküll, T. v. 1997: 449–450; Krampen 1989). A semiotic analysis of the sign systems and processes of the guide dog teams can find application in the proposals for (semiotic) solutions to make the movement of the team in an urban environment smoother. That concerns the insertion of cues into the urban environment that would be accessible for the team; learning and teaching about the semiotic capacities of the other species for the guide dog handlers; and raising awareness about the specifics of the sign usage of the guide dog teams for the general audience.

1. Guide dogs as perceptual aid

Although guide dogs are often called the 'mobility aids' of visually impaired persons and their cooperation with the handler does indeed result in a better mobility of the latter, the mechanism and ultimate character of the aid is still based on perception and the mutual supplementation of two perceptual systems. Another common way to describe guide dog aid is to say that a guide dog replaces the eyes of the blind person. But this is not fully correct either, given the differences between the perceptual systems of humans with normal vision and dogs. In a review table of the differences between human and canine sensory systems, Ádám Miklósi has indicated that in comparison with the normal vision of humans, dogs have a wider visual field and a more restricted binocular visual field, and they cannot distinguish between the middle to long wavelengths nor between different shades of gray that the human eye can differentiate (Miklósi 2007: 140). Dogs' wider hearing range and sensitivity to lower concentrations of different chemicals make them more receptive to olfactory and acoustic cues. However, knowing the sensory physiological premises of the two species is only a starting point for telling which objects the subjects really respond to and in

[1] Some of the ideas presented in the following chapters have been already covered in a couple of earlier papers, which analyse the sign usage of guide dog teams and the challenges related to that (see Magnus 2014b, 2016). This chapter aims to synthesise the previous findings and to place them in a common semiotic frame of analysis.

which way. A semiotic analysis could supplement such a sensory physiological analysis by studying which of the potentially available percepts the animal does endow with meanings and does take as guides for further action. The mapping of the individual perceptual systems serves as a ground to further delineate the umwelten of the two individuals and to observe the possibilities for their complementary functioning. Jakob von Uexküll and his colleagues tried to work along these lines when studying the umwelten of dogs (Uexküll, Sarris 1931). They observed how the dog's understanding of things to sit on, things to lay on, and so forth differs from that of humans. Given these observations, one might further clarify in which parts the human and canine umwelten should be brought to overlap, if indeed one of them is to help the other.

An analysis of umwelten allows us to take a more detailed look at the overlap and divergence of the objects, the perceived sign vehicles[2] and the meanings of the two members of the guide dog team. On this basis, an assessment of the accessibility of different environmental objects can be given, and the reasons for the lack of access can be described. First, there are objects in the urban environment that both individuals can recognise via the same sign vehicles and that carry the same meanings for both, such as working noisy machines, which both individuals recognise and tend to avoid. Second, there are objects that are perceptible via different sign vehicles for the team members and that carry a different meaning, such as lantern posts, which should be avoided as obstructions for the blind but which are attractive marking places for dogs. Third, there are objects in the environment that are perceptible via different sign vehicles for the team members, which are meaningful for one counterpart but meaningless for the other, such as benches or elevators. Fourth, there are elements that become perceptible only after specific training and after the acceptance of the other subject as one's counterpart, such as open windows or any other objects that lie above the dog's head. Fifth, there are significant objects, the sign vehicles of which are imperceptible for both subjects, such as the green and red lights of traffic lights. Such a mapping of the two umwelten allows us to decide which elements of one subject's semiotic system are able to supplement those of the other, and in which cases such a supplementation is impossible. In the latter case, the cues indicating the objects in the environment should be changed (as is done by the addition of acoustic signals to traffic lights).

The perception of the members of the guide dog team involves not just receiving and interpreting information stemming from the environment, but also active attendance to and search for cues that would help to guide the activity at hand. The guide dog who assists a visually impaired person in his/her movement and orientation is just as much a producer of environmental information as

[2] The term sign vehicle is here used in the sense of Charles Morris, as a particular physical event – such as a given sound or mark or movement – which mediates something and which is taken account of (Morris 1971: 96, 19).

he/she is a receiver or mediator of this information. On the other hand, the guide dog team moves in a setting that is already charged with meanings and meaning-carrying cues. The design of buildings, the networks of streets and the segmentation of urban space offer guidelines for orientation, movement and spatial positioning – the meaning is hence built into the urban environment. Following James Gibson's line of thought, this induces a certain attunement of the organisms to the variables and invariants of information in the environment (Gibson 1979: 247; see also Greeno 1994: 377).

The major alternatives to guide dogs as perceptual and mobility aids are technical vision aids and the aid provided by accompanying human beings. Like technical aids, guide dogs supply their handlers with the feeling of independence, gained through the opportunity to choose one's routes and paths while not depending on another person's time and availability. In addition, guide dog aid introduces another kind of independence, which is inaccessible via technical and mechanical aids – independence from the constant need to process and keep one's attention on all sorts of environmental signals that might indicate one's location (Richter 1995: 104–105). However, without the recognition of the interdependence of the two organisms as the fundament of guide dog work, neither of the above mentioned independences can be attained. If the dog is treated as a technical device rather than a living organism with his/her own needs and capacities, the co-movement can escalate into a conflict or a surrender of one member instead of a cooperation (see Sullivan, White 1991: 81). If, on the other hand, all the 'work' part is left to the dog during movement, the handler may find him/herself following the paths and interests of the dog, which may not necessarily coincide with his/her own (see Hocken 2011[1977]: 121).

In anthropology as well as in technology studies, the technological supplementation of human perception and action and its foundational significance for culture has been treated in terms of extrasomatic mechanisms (White 1959) or exteriorised organs (Leroi-Gourhan 1993[1964]). Any new technologies or perceptual tools (Uexküll 1992[1934]: 319), which allow access to previously inaccessible stimuli (from UV-light to ultrasounds), can be seen as extenders of the human umwelt. In this context, the devices visually impaired persons use for their orientation are just one of many such 'extensional organs' people daily employ. As devices and mediators, they are objects through which other objects are perceived. Hence they have a special status as phenomena – instead of being objects that are perceived, they are objects that are perceived *with* (see also Merleau-Ponty 2005[1945]: 165). Although the most common non-living seeing aid used by blind people are white canes, several technical seeing and mobility aid devices have entered the market in the past decades. These can be divided into two basic classes: those that are placed into the environment and send out signals (e.g. Remote Infrared Audible Signage [RIAS] or Talking Signs) and those that are carried by the visually impaired person (from sonic guides to lazer canes).

Differences in the reception and transmission of environmental cues through technical devices or via another organism become evident if the agency and cognitive aspect of the animal is accounted for. A guide dog serves as a selective and interpretive filter of environmental cues. The dog makes an initial selection of all the percepts available for his/her perceptual system, while relying on the meanings s/he is seeking for or attending to. The search for certain percepts can be guided and narrowed by the instructions of the handler, but even in these cases, the individual decisions of the dog about relevant cues are crucial for the movement of the team. The selectivity of the dog with respect to the environmental cues prevents the entrance of excessive signals into the handler's perception, which is a common drawback of technical vision aids.

As dogs come to distinguish between significant and non-significant cues via learning, they remain flexible in modifying their choices and preferences throughout their work. This also means that a dog can forget and make mistakes in his/her choice or response to the signs. Since a guide dog, unlike a technical device, is not supplied with a preexisting and fixed algorithm of signal detection, feedback and positive reinforcement are essential to maintain attention to some environmental cues and meanings while omitting others. In order to avoid developing a habitual and mechanical sign usage, the dogs also have to face new constellations of cues on a constant basis, even if in those situations the animal is more prone to make mistakes. If dogs follow the same route every day, inattentiveness to the novel cues may ensue, and unexpected situations may not be met with adequate responses.

Using dogs as a seeing aid requires the differences in the perceptual systems of dogs and humans, as well as the differences in their body plans, to be accounted for. The urban environment affords its inhabitants certain cues and meanings, and in turn, it 'demands' certain responses from those who want to navigate there. The combination of the canine's and the visually impaired person's sensory systems gives them better access to the affordances of urban space than each of them could access with their individual senses. For example, the human command to find a zebra-crossing and the dog's perceptual ability to find such a place guarantees a safer crossing of the street for the dog as well as for the human. As a drawback, such a combination of perceptual systems raises the salience of cues that they would not need as individuals. Handlers need to be attentive to other pet animals walking in the streets, to patches of lawn that gird the streets, and to dropped pieces of food and other objects attractive for the dogs. The dogs need to attend to open windows and to obstructions lying above their heads (under which they could easily run if they were on their own), not to mention all the objects initially insignificant for them but taught to them during training – benches, doors of vehicles, elevators, etc.

Besides the transformation of the perceptual worlds of the team members, their effector worlds are also significantly changed during their co-movement.

In Jakob von Uexküll's terms, an effector world consists of effector cues, i.e. of those cues to which the organism should give a motoric response (Uexküll 1992[1934]). Due to the physical attachment of the two subjects, the activities to be carried out depend on the bodily presence of another being, e.g. the objects that the dog could previously jump over or run under cannot be acted upon in the same manner when the visually impaired human is walking next to him. In other words, a shift takes place in what William Warren has called the critical points and optimal points in the organism-environment system (Warren 1984: 687). The critical points form the boundary conditions of movement or the handling of an object (e.g. how high and wide a gap between the platform and the train door should be so that it could still be crossed by the team). The optimal points refer to the properties of some element that the subject prefers and feels most comfortable with (e.g. the height and width of the platform-door gap that would demand the least effort from the team for crossing). The motoric response in these cases is never exempt from the perceptual ground – carrying out or abstaining from carrying out certain activity presumes a perceptual assessment of one's position and body-plan with respect to the environment. The case of the guide dog team demands the consideration of a body plan (which is extended by another being) and an assessment of the situation based on the attachment of the two organisms.

2. Interspecific communication of the guide dog team

As was indicated in the previous paragraphs, guide dogs do not transmit to their handlers raw unprocessed percepts, but rather certain interpretations of the environmental cues they have encountered. Moreover, a concrete act of signification or a response to some element in the environment makes sense only in the context of the previous interactions of the team members. If the guide dog comes to a halt, then such a behaviour can have dozens of meanings, but if the handler has previously asked the dog to find a zebra, it means that a place which can be safely crossed is now in front of the team. If the handler has not given a search command prior to the halt, it most probably indicates an obstruction. Hence, depending on the previous chain of communication acts, the meaning of one and the same signifier can vary. This also points to the fact that perception and communication in the guide dog team's interactions cannot be fully separated.

Ethological research conducted on human-dog communication in the past one and a half decades shows that the dog's coinhabitation with man has also brought along the development of specific communicative skills.[3] Those skills are

[3] However, this theory has been challenged by the canine cooperation hypothesis, according to which wolves are as attentive to their social partners as dogs, and dogs' social skills hence have an evolutionary origin (see Range, Virányi 2015).

sometimes referred to as human-like social skills (Hare, Tomasello 2005). Among them, the dog's ability to attend to human ostensive-referential cues has gained special attention (Miklósi, Topal 2013; Kaminski, Nitzschner 2013). This means that dogs are talented in distinguishing and responding to human signs that are specially addressed to them. These skills are the ultimate premises of guide dog work – without partially shared communication systems, the two individuals would not be able to inform each other either about their intentions or about the environmental objects. The research on 'addressing signs', or signs that are employed to establish contact between interactors, has shown that eye signalling is one of the chief means of establishing contact between dogs and humans (Kaminski *et al*. 2012; Virányi *et al*. 2004). At the same time, eye signalling along with pointing gestures (Miklósi, Soproni 2006) is also important for referential communication between humans and dogs (Téglás *et al*. 2012). As such a "natural" means of communication is missing from the interactions between guide dogs and their visually impaired handlers, alternative communicative signs have to be developed through training and cooperation.

Guide dog users employ different combinations of addressing and referential signs in their cooperation with their guide dogs, depending on the situation and on the capacities and preferences of the dog, as well as those of the handler. Some handlers make use of special addressing signals (like clicking sounds, saying the dog's name before the command word, etc.), which are temporally separated from the referential words of command. Others pay attention to the mode of expression when giving the dog a command (intonation and tone of the voice, or supplementation with other encouraging acoustic or tactile cues). Special attention to the contacting signs is essential for keeping the dog's attention on the work and on the activities of the handler. Unlike pet dogs, who are only occasionally addressed with obedience commands or asked to carry out some tasks, the communicative bond between the visually impaired person and the guide dog has to persist throughout the movement of the team, and this can sometimes last for hours. Besides the differences in the addressing signs used in the guide dog team's work and in the interactions between a pet dog and a seeing handler, the referential signs are also different from those used by pet-dog handlers. One of the major differences pertains to the specificity and extension of the sign. When asking the dog to take a left turn or find a bench, the person may have only a vague idea about how far or in which direction the object of reference lies. With their utterance, the handlers produce a type rather than a token, and the localisation and identification of the object require more independent effort and more processing of environmental cues by the guide dogs than is necessary for pet dogs. The dogs may use different mnemonic strategies to find environmental correspondences to the directions or guidelines given by the handler. In some cases, the dog has memorised cues that are specific to a particular place – as when the handler asks the dog to find the way home. In other occasions, the dog

may have learnt to identify a type of place via some cues specific to these kinds of places – this is so when a dog is capable of finding a cafe in a place where s/he has never been before.

The question of 'referentiality' has been in the focus of inter- and intraspecific communication research since the 1960s (Struhsaker 1967). One of the major points of debate has concerned the question of whether animal communication can entail real external reference, i.e. (intentional) mediation of information about a state of the environment or about whether it simply is an expression of the animal's internal state as an immediate response to some external stimuli (e.g. Smith 1969). Several later studies have concluded that animal communication entails an affective as well as a referential component (Hauser 1996: 473–522; Manser *et al.* 2002). However, at least in the context of guide dog work, such a separation does not necessarily make sense in the first place. Several informants, whom I interviewed for my previous studies (see Magnus 2014b), noted that their own confidence or confusion in certain situations is, as it were, "carried over" to the dog. Hence, the meaning that the dog attributes to the object also depends on the emotional state with which the handler approaches it.

Although the establishment and the keeping of contact and referential communication appear to be the most important forms of communication for guide dog work, another particularity of the team's interactions concerns metacommunication. Metacommunication refers to the team members' ability to recognise such signs in the other's behaviour that help to contextualise other signs produced by him/her. Above all, this concerns the skills to frame and to interpret the other's signs either in the context of guiding work time or off-work time. Occasionally, the dog as well as the handler may attend to objects and signs that are of interest for him/her only and which divert his/her attention from the signs necessary for guiding work. If the other counterpart recognises such a diversion, s/he can direct the other back to the necessary frame of meaning. The handlers often use non-verbal acoustic signals and also give tactile signals via the harness to direct the dog's attention back to work. In addition, it is possible to use preventive communication to obviate such diversions – to talk to the dog on a regular basis, to give feedback as often as possible, etc.

The movement of the guide dog team involves not only orientation in physical space, but also entails one's positioning in social space just as much. In other words, guide dog work consists not only of communication between the two team members and their mutually coordinated relations with the environment; it also consists of interactions with other pedestrians, pet-animals, urban wildlife, etc. When moving with their handlers, guide dogs are not supposed to contact other passers-by. What they certainly do, however, is observe the movement and activity of other people and use this to shape their own activity. In some occasions, the human use of objects helps to specify the meaning of physical elements – e.g. when people cross the street at a green light, sit on the bench or

open a door. In other cases, people's behaviour does not correspond to or even contradicts the intended meaning of some structures in the urban environment (e.g. people crossing the street at a red light or taking shortcuts across the lawn).

Conclusions

In addition to sociological, ethological and psychological studies, a semiotic investigation of the interactions between visually impaired persons and their guide dogs can enhance an understanding about the specifics of such an interspecific cooperation. A parallel description of the umwelten of the two individuals and the affordances of urban space allows one to demonstrate the correspondences and discrepancies between the two. A delineation of the discrepancies in turn allows one to further investigate whether they can be alleviated through a task specific combination of the two umwelten or whether some changes should be brought about in the environment.

A semiotic analysis of the guide dog team's cooperation indicates that an umwelt is not a function of perceptual and motoric responses to environmental cues only, as was primarily stressed by Jakob von Uexküll; rather communication with other beings can also play a significant role in umwelt formation. In addition, the cooperation of guide dogs and their visually impaired handlers exhibits a particular instance of the context dependency of meaning attribution. The context here is determined by the needs of another being, more specifically by his/her needs to access some objects which s/he is not capable of detecting with his/her own perceptual system. Unlike the vision aid provided by technical devices, guide dogs do not serve as simple extensions of human senses but add another interpretative level to the reception of environmental cues. Although a possibility remains that dogs depart from their individual propensities in their choice and response to signs, they filter out most of the cues unnecessary for movement and, after undergoing training, are capable of relying on and transmitting the information most essential for the handler's mobility.

Semiotic tools could also be used to analyse the convergence of human and non-human umwelten by other types of interspecific symbiosis. Domestic animals and the growing number of urban species could provide rich material for such studies. In narrower terms, other functions of animal assistance – hearing aid, mobility aid, therapeutic aid – could be of interest for semiotic studies. A comparison of different forms of canine assistance would allow us to demonstrate which part of the canine umwelt remains constant throughout different functional contexts and which part of it can be molded for specific human purposes.

Acknowledgements

The research for this chapter was supported by the institutional research grant IUT02-44 from the Estonian Research Council and by the Norway Financial Mechanism 2009–2014 (project contract EMP151).

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This volume has been published with the support
of the Norwegian–Estonian Research Cooperation Programme