Sign Systems Studies 37(3/4), 2009

Monsters we met, monsters we made: On the parallel emergence of phenotypic similarity under domestication

Karel Kleisner[1], **Marco Stella**[2]

[1] Department of Philosophy and History of Science, Charles University, Viničná 7, 128 44 Prague, Czech Republic
e-mail: kleisner@seznam.cz
[2] Department of Anthropology, Faculty of Humanities, Charles University, Husníkova 2075, 15000 Prague, Czech Republic
e-mail: marco.stella@email.cz

Abstract. Creatures living under the rule of domestication form a communicative union based on shared morphological, behavioural, cognitive, and immunological resemblances. Domestic animals live under particular conditions that substantially differ from the original (natural) settings of their wild relatives. Here we focus on the fact that many parallel characters have appeared in various domestic forms that had been selected for different purposes. These characters are often unique for domestic animals and do not exist in wild forms. We argue that parallel similarities appear in different groups in response to their interaction with the umwelt of a particular host. In zoosemiotic sense, the process of domestication represents a kind of interaction in which both sides are affected and eventually transformed in such a way that one is more integrated with the other than in the time of initial encounter.

1. Introduction

The domestication of plants and animals is considered among the greatest of human deeds along the path to civilization, alongside such achievements as the control of fire, and the use and manufacture of instruments. Nevertheless, do we hold the process of domestication firmly in our hands? Do domesticated phenotypes represent a result of mankind's deliberate control of breeding? Or, alternatively, are we dealing with a mutual process wherein both sides took significant part? Why do we report parallel origination of similar features amongst domesticated animals of different sorts? How does this parallelism link with the phenomena of domestication? These are but a few of many questions erected upon the phenomena of domestication.

Here we focus on symptoms of domestication, and especially on those expressed on the surface of animals. The outermost surfaces of living beings represent more than the mere mechanical barrier or physical boundary of the body, but also a peculiar kind of organ with the potency to establish that organism's world relationships (Portmann 1960a: 102f.; 1960b; 1969; 1990: 205). Surface appearance informs other living beings about the inner state of the bearer; they clearly show not only the actual inner attitude, but also the bodily embedded evolutionary experience of the lineage. In fact, interpretation of the outermost aspect of organisms is the only way in which to approach the realm of organic inwardness.

The surface dimensions of organism were largely neglected within the biology of the entire twentieth century. It is a kind of scientific folklore to consider all what appears on the surface as superficial and thus epistemologically trivial. This is mainly because of the metaphysical power of general conviction that true reality hides behind unreliable appearances. However, the surface capacities of organism involve not just visual forms and patterns, but also olfaction, palpation, and eventually all behavioural aspects. No surprise that especially these manifestations essentially partake in communication processes in animal world. Such manifold expressions of living things have been covered by the single concept of *semantic organ*: semiautonomous entity dependent on umwelt-specific interpretation; semantic organ can be unambiguously derived neither from its anatomical, morphological and genetic nature, nor from the standpoint of the physiology of a perceiver. Rather, every semantic organ exists at the interface between the expression of physical features and their interpretation. Semantic organs thus work thanks to a meaningful interaction of embodied perceivable traits with the structure of the umwelt of a particular perceiver (Kleisner 2008: 219).

In this paper, domestication is conceived as a kind of mutual interspecific communicational process, which involves both "domesticating" and "domesticated" species as active participants. Both parts not just participate in the process but also are changed during a history of mutual interaction. Therefore we regard the basic division of rational human selector and submissive domestic animal as, at the least, problematic.

2. On biological similarity

Animate nature shows a fascinating web of sense based on interlaced appearances bodily expressed by various lineages of organisms. Life's manifold representations resemble each other, thusly providing opportunities for comparative work that results either in various systematizations or in examinations of the causal reasons that have led to the establishment of resemblances in living nature. The first approach is searching for homologies whereas the second reveals the homoplasies (analogies) amongst organic world. Since Darwin, the importance of homologies has been especially stressed because the quest for the tree of life had been regarded as the main goal of all biology. Nevertheless, phylogeny does not fully explain the evolution of biological resemblances. Nowadays, perceivable appearances play only a marginal role within the science of biology. Mostly, it is shrewdly chosen pieces of DNA, not morphological data, which is effectively used for inferring phylogenies. However, with the development of the phylogenetic program, a more and more complete picture of kinship among various groups was drawn. This eventually led to the restoration of interest in homoplastic similarities among non-allied, or distantly related, organisms. And hence, homoplasy came to represent an important evolutionary keyword of the day. The term homoplasy is usually defined as derived similarity which is *not* the result of common ancestry. For some biologists, homoplasy may still represent negative informational noise within phylogenetic analysis, whereas by others, homoplasy is regarded as an opportunity to study the range of evolutionary phenomena as, for instance, convergence, parallelism, phenotypic plasticity, and even mimicry.

Imagine the manifold cases of animal mimicry wherein two unrelated species tend to be closely similar in appearance, for instance, because of protective advantage against predator. It is hard to believe that the origin of such striking resemblances was managed *only* by genetic mutation, variation, and natural selection. Nevertheless, if one considers that some underlying genetic and developmental cues are highly conserved among all animals, then mimetic reality can be less surprising. These latent genetic and developmental underpinnings may be preserved by certain lineages being later occasionally reactivated under a specific condition. In this sense, homoplasy need not be newly derived in absolute terms; one can rather talk about a kind of "evolutionary re-calling". Such a "re-call" happens under conditions that may be similar but are never the same as was those in the past. Therefore re-evolved characters can never be identical but only similar; moreover, this is also why no imitation is perfect, despite the fact that it remains very effective! Questions of the guarantor of this effectiveness belong to the realm of zoosemiotics.

There are presumably at least three reasons explaining how similarity comes into existence: (1) *external constraints* caused by environmental circumstances as described in ecology and paleontology; (2) *internal constraints*, in old German literature referred as *innere Ursache*, encompasses all developmental and genetic underpinnings. These internal and external causes represent only the prerequisites, however necessary, for establishing similarity. The *recognition* of similarity means that some kind of affinity among two things is revealed (that is, perceived) by a particular interpreter. Therefore we must also take into account the (3) *Semiotic* (or *Zoosemiotic*) component — the umwelt-specific interpretation of signs that stands for the similarity.

We argue that parallel similarities between domestic animals and man, and among domestic animals themselves, have such an irreducibly threefold origin. The "zoosemiotic component" is especially important because it establishes previously existent resemblances as meaningful amidst the umwelten of particular living beings, and thus drives processes wherein coexistence, interaction and communication play a crucial role; such as the process of domestication. Whether this is also valid for relationships between ants and termites, and their curious guests will be discussed.

3. Under Man's dominion

It is often the case that domestic animals of different phylogenetic origin that were bred for absolutely different purposes under distinct geographical and cultural conditions show a lot of common features: especially the similarity of coat colour patterns, horns, and other surface structures (Herre and Röhrs 1973: 117). The various speculations on the "domestication syndrome" (see for example Hammer 1984) present in animals as well as plants seem to be almost lacking in recent literature. Nevertheless, several features that characterize domestic phenotypes could be listed. These features are reportable not only in domestic animals but also in humans. However in the case of humans, we have no chance to make comparisons with a wild form as is, for instance, possible in the dog and wolf couplet. Blumenbach was probably the first to formulate the idea that man — the master of all domesticated animals — is himself virtually the most domesticated (Blumenbach 1806: 43). This is mainly because a man is always born into the bosom of culture and this is also why the wild form of "human being" does not exist at all. Moreover, Blumenbach, among others, studied the natural varieties of human kind and of pigs using the same term "race" for both.

What do we consider under the phenomenon of domestication? Here we are using a rather general definition of domestic animal *sensu lato*, which also involves creatures that are not usually considered domesticated (as "domestic animal" is sometimes associated with "farm animal"); hence lab rodents, various pets, and eventually also humans are taken for *domestic animals* here. In the most general sense, domestication may be defined as follows: *Domestication is an evolutionary process of genetic and ontogenetic adaptation of organisms to the conditions of culture. At the same time, domesticated animals shape, maintain and spread the cultural environment.* The second sentence excludes commensalism, and parasitism, which may exist in a cultural environment but do not contribute to the expansion, or even the maintenance, of such an environment.

Which features are characteristic for a domesticated phenotype? Although we mention only the most conspicuous ones herein, it is necessary to say that the process of domestication affects every part of the animal body from those most apparent to those barely noticeable.

At first sight, the most apparent feature is the variation of colour coat pattern. Domestic animals express patterns and colours that are never present in wild forms. Interestingly, in many domestic animals we find black, white or blond, and also red-haired forms; note that the same is true for humans! One may also report the frequent occurrence of spotty and patchy phenotypes. These colour patterns are also often asymmetrical, which is a property that almost never occurs in free living animals (see Fig. 1). Adolf Portmann (1960b: 3132) refers only to a few exceptions from this rule: Harbour Seal (*Phoca vitulina*), some species of toothed whales (Odontoceti), and the African Wild Dog (*Lycaon pictus*). Other characteristic colorations of domestic animals consist of black spots and flecks exposed on a white background; the black elements are usually concentrated on the opposite body poles or, conversely, in the central part of the animal body.

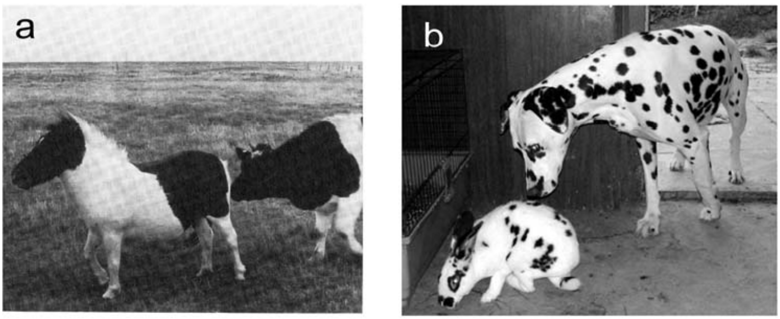

Figure 1. Examples of the parallel occurrence of asymmetrical colour coat pattern in domesticates: (a) polar colouration, (b) black spots on white background. After Nachtsheim and Stengel (1977).

The distribution and density of fur, as well as the shape of the single hairs, are no less variable than their coloration. There are races with extremely dense and fine fur (various angora forms) but also races that are absolutely hairless, as for instance the Mexican Hairless Dog (Xoloitzquintle), "Sphynx" cat, and various races of pigs (see Fig. 2). One may find domestic mammals with enormously long fur as well as those with curly or wire-like hair etc. These specific parallels in surface variability between humans and domestic animals were reported by German anthropologist Hans Friedenthal at the beginning of the twentieth century (Friedenthal 1908–1910).

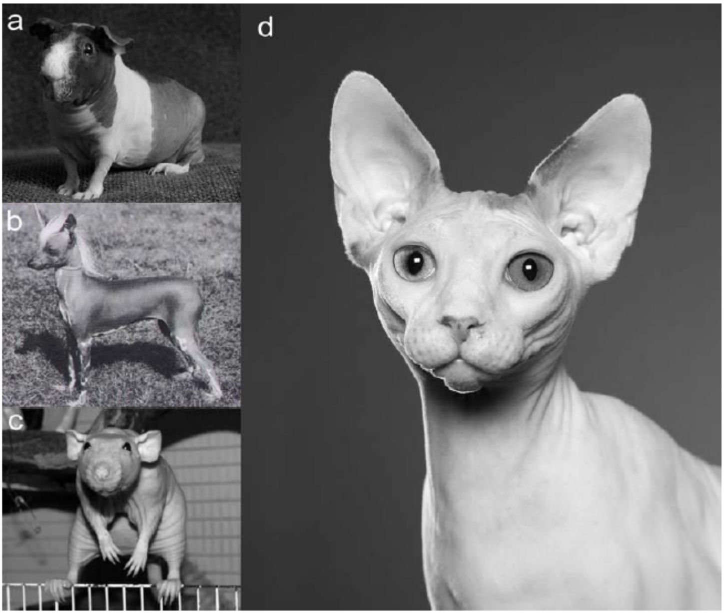

Figure 2. Hairlessness in domesticates: (a) naked guinea-pig, (b) Chinese crested dog, (c) naked rat, (d) Sphynx cat.

Note that in wild living animals the fatty tissue is deposited especially around the inner organs. In some races of domestic sheep, enormous deposits of fat may also be located in the tail. Some old-school anthropologists have interpreted the steatopygy of Khoisans and other African ethnics as a parallel expression of the same phenomenon in man.

The other noticeable effect of domestication that we may find in both man and domestic animals is the high variability in body size. The early stage of domestication is supposed to be accompanied by a decrease in body size. A similar trend, accompanied moreover by a worsening of health condition and increasing degeneration is also reported in populations of early Neolithic people compared to their hunter-gathering neighbours and ancestors (for discussion see: Leach 2003; Cohen, Armelagos 1984). After the initial stages of domestications, however, most domestic animals increase in size to such an extent that they exceed their wild forms. This initial decrease and consequent increase in the size of domesticated animals is due partly to unfriendly conditions throughout the first period of domestication and partly because of selection on the part of their human masters: the smaller meat "conserve" is useful in that it is easier to transport and when "opened" people consume it immediately and nothing gets spoiled. Nevertheless, as the human population grew and conservation techniques got more effective, the call for larger "conserves" increased; and together with domestic animals, so too have their human "masters" slowly grown. With such systemic changes in size, some extraordinary deviations have also appeared. It is the gigantism, dwarfisms and following allometric growth which results in pathological changes that would be lethal in natural conditions. Allometric growth somehow affects almost all organs and body parts, including the brain and endocrine glands that have a direct influence on behaviour, which points at the very precise attunement of growth ratios and rates in the vital wild phenotype. These destabilizations in the growth rates of different body parts and organs eventually result in an overall change of body proportions (Belyaev 1969).

Moreover, skeletal modifications are among the essential symptoms of domestication. Frequently we may see changes in the number of vertebrae, especially caudal vertebrae in tail whereon the modifications of various kinds take place, for instance the tails of pigs, and also of some dogs and cats, turned to a spiral shape. Such skeletal changes are almost always connected with modifications in the shape of the rib cage and a shortening of legs. Generally, the bones of domestic forms are usually wider in diameter than those in their wild relatives. These are however more fragile and much more "sloppily" conjoined (Herre, Röhrs 1973: 96).

Also, the head bears many of the traits typical of domesticated phenotypes. Thus, for instance, the ears of many domestic animals are not erect as in wild forms but often hang loosely down, as was noticed already by Darwin (1859: 11). One very typical feature found in early as well as long time domesticated animals is a shortening and widening of the facial part of skull, which is known under the lovely German term *Vermopsung* (getting pug-like). To a certain degree, this phenomenon occurs in many domestic animals, but we meet the most striking representation only in some extreme forms with apparent malocclusion such as Pug-dog, Bull-dog, Boxer, and also some races of cats, pigs (e.g. Middlewhite), and cattle (e.g. Niatu) (see for example Herre 1980; Clutton-Brock 1999: 31–32; see Fig. 3).

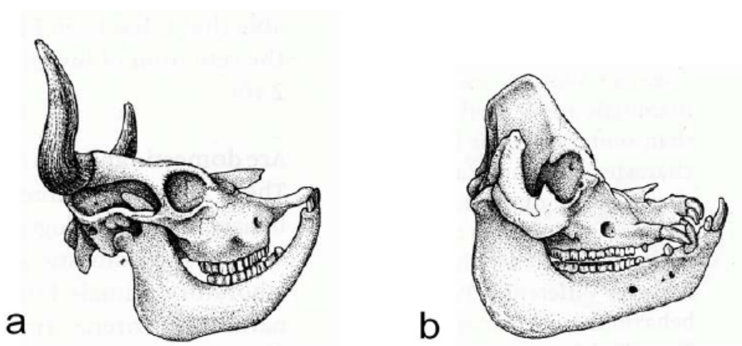

Figure 3. Shortening of the skull as a result of domestication: (a) Niatu cattle, (b) Middlewhite pig. After Clutton-Brock 1999.

The result of *Vermopsung* is a skull with a relatively larger parietal and occipital regions and a small facial part. Such morphology of the skull may resemble either the skulls of the cubs as we see in the case of Pekinese and Pug-dog, as well as the skull of anatomically modern man (in comparison to anthropoid apes and different members of the genus *Homo*). Domestic animals with anthropomorphic features, often enhanced by the aforementioned changes in their skulls, are frequently very intimately integrated into human communities, fitting the role of "never-growing and ever-charming babies". No matter that such pets starve due to abnormalities in the development of dentition, decreases in tooth size and low dental quality, and also a reduced number of teeth: consider the ever decreasing number of people capable of a healthy growth of their third set of molars (wisdom teeth).

Perhaps the most prominent and also most reliable character of domestication — which is even used by archaeozoologists as diagnostic criteria for domestic phenotype (Leach 2003) — is the considerable reduction in relative as well as absolute amount of brain mass (and brainpower). The numbers in brain mass decrease are really high: 30% in dogs, 24% in pigs, 19% in horses, and 24% in sheep (Herre 1980). The cerebrum (telencephalon) and sensorial regions are especially affected by the reduction.

In rather Uexküllian style, Helmut Hemmer (1990) has aptly characterized domestication as "the decline of environmental appreciation" (*Verarmung der Merkwelt*). Konrad Lorenz characterized domestication and its influence on perception and cognition in almost the same way (Lorenz 1997). It is worth of note that from the Holocene period *Homo sapiens* has undergone a considerable brain size reduction, namely about 10–15% (Wrangham 2009; Henneberg 1988; Henneberg 1998). Such a radical decrease in absolute brain size is often interpreted as a necessary effect of the more general trend connected with an overall decrease in human body height during the late Pleistocene and Holocene (Henneberg 1998; Ruff *et al.* 1997). There are, however, some disputes whether brain reduction also happened in relative terms. According to Henneberg and Steyn (1993), a reduction of the skull (brain) size was also accompanied by brachycephalization. Let us remember that decrease of body size, brachycephalization, and absolute and relative reduction of brain mass are among the symptoms of domestication which are most probably underpinned by the same causal events in both animals and humans

(Leach 2003). Among the possible causes may be listed: radical worsening of nutrition, earlier sexual maturity, more frequent pregnancy, higher amount of progeny, new epidemic diseases, and generally less appropriate living conditions. Why, then, would our ancestors have been settling down? If sedentism and agriculture were products of intelligence — and not the result of necessity — our ancestors certainly miscalculated themselves. Perhaps the early peasants replaced hunter-gatherers only because they, despite their bad health condition, simply outnumbered the hunter-gatherers.

It could be surprising to consider how many diseases come from our domesticated friends. Thus, for instance, the virus of morbilli (measles) is a close relative to the rinderpest virus (RPV), which causes the cattle plaque. Tuberculosis (*Mycobacterium*) and smallpox (*Variola*) also originate with cattle, and we have pertussis (*Bordetella pertussis*), also known as whooping cough, from dogs and pigs (Williams, Nesse 1991; Diamond 1997).

The biological consequences of domestication are manifold. Besides the mentioned changes in epidemiology and subsequent modifications in immune systems, one may also report changes in digestive systems, metabolic processes, endocrine systems etc. (for further descriptions of domestication symptoms see Clutton-Brock 1999; Zeuner 1963; Herre and Röhrs 1973, 1990; Mason 1984). In short, one finds almost nothing untouched in domestic animals.

4. Companions in the umwelten of ants and termites

Similarly to the domestic co-inhabitants of human niches, we also find many guests in the nests of social insects. Some of them are more like invaders (predators) feeding on the larvae, eggs or adults of their host, others not especially invited but are tolerated as commensals (or facultative parasites), and finally, yet others represent real comrades (or VIPs) that are highly integrated and absolutely addicted to the colony life. Here we focus on the animals, especially the insects, associated with termites (termitophiles) and ants (myrmecophiles); and knowingly leave aside the guests of other social insects. There is quite a range of beings differently adapted to life in the closeness of termites and ants. Termitophiles are reported among different arthropod groups namely arachnids, nematods, diplopods, mites, crustaceans and many insects involving members of Thysanura, Psocoptera, Neuroptera, Coleoptera, Lepidoptera and Diptera (Kistner 1990). Similarly, the associates of ants encompass arthropods, especially many insects, arachnids, mites and even molluscs (Witte *et al.* 2002).

The idea that some alien species could enter the other species insect society, without being immediately killed or expelled, and adopt a set of natural conventions that would be meaningful in the umwelt of the host species, seems to be definitely improbable. Such an event is no less hazy than the first steps of animal domestication by humans. Coexistence with termites and ants is based on specific kinds of interactions and communicative acts such as tactile stimuli (palpation), trophallactic exchange and grooming, all of which are importantly conditioned by the semio-chemical signature of nest inhabitants; today, a rather classic idea: "Colony odors are evidently quite specific in character; some may be characteristic of the species, others of the individual colony, and termites are probably accepted or rejected on the basis of their odors" (Seevers 1957: 17). Earlier still, the various integrative knacks such as tactile mimicry (*Tastmimikry*) and "odour-form" (*Geruchsform*) were described by Reverend Erich Wasmann, who laid the groundwork for the study of the guests of ants and termites (Wasmann 1890; 1925). Nowadays, there is rich chemo-ecological evidence for various chemical mimicry (or oudour-form) based on the specific presence of cuticular hydrocarbons (Howard, Blomquist 2005; Geiselhardt *et al.* 2006; Elgar, Allan 2004).

Considering the importance of chemical and the practical absence of visual communication, various morphological changes that occur in parallel within different groups of the guests of social insects seem to be rather superfluous, or at least strange in this respect. One of the most remarkable phenomena that we found in some groups, termitophiles in particular, but also myrmecophiles, represents physogastry. "Physogastry is the enlargement of the abdomen of many species by the proliferation of the membranous areas, the expansion of the fat body inside the abdomen, and sometimes the subsequent secondary sclerotization of some of all of the expanded membrane. This is accomplished by a process called postimaginal growth" (Kistner 1990: 201). Physogastry can affect also the other body parts like legs, thorax and even the head (Jacobson *et al.* 1986: 140). Post-imaginal growth represents a very curious process that occurs rarely among insects and is produced especially within the environment of insect societies. In ants and termites, physogastric features develop only in special castes such as queens and sometimes also king termites or drones. Note that physogastry never occurs, at least so far as we know, in free-living insects. However, it may emerge among absolutely unrelated groups of insects that are integrated within termite and ant societies. Accordingly, it seems that physogastry has something to do with exposure to the termite niche. Consider the analogy of the previously described symptoms of domestication generated within the human niche wherein the parallel emergence of similar features in unrelated groups of mammals was reported in ways similar to that of physogastry among the guests of termites.

As in the case of domestication, sometimes it is hard to say who was tamed by whom, or, who is whose master. The advantages resulting from the adaptations of a "domestic" phenotype are disputable; irrespective of whether it is men or social insects that represent the selective agent. Modifications represent usually useful adaptations to the internal environment of the host species. Life under the protection of others, however, is partially followed by a reduction of world relationships, and loss of independence compared to free-living organisms. In most extreme cases this includes a complete loss of mobility.

For example, Scuttle flies (Phoridae, Diptera) parasitically associated with ants or termites often show a characteristic reduction of regular dipterans ground plan, being often legless, flightless, with a larviform abdomen (for example, Disney, Kistner 1989; Weissflog *et al.* 1995). It looks like a tradeoff: changing the freedom of world-relations for the access to a host's communicative network (Kleisner, Markoš 2005).

5. Discussion and conclusions

Exposing various kinds of animals to the same or nearly the same conditions may lead to the emergence of similar features that may occur even in distantly related groups. The similarity of such features can thus be explained neither by commonality of descent nor by simple convergence due to some external environmental causes. Similarly, characters typical of domestication are not just a result of any single natural influence or cause; neither are they the result of man's intention to select expedient properties. Charles Darwin was aware of this last fact, as he mentioned in his introduction to his *The Variation of Animals and Plants under Domestication* (Darwin 1868): "It is an error to speak of man 'tampering with nature' and causing variability. If organic beings had not possessed an inherent tendency to vary, man could have done nothing". The act of domestication is thus a process that is dependent on both man's intentions, however conscious or unconscious, and the particulars of an animal's given propensity to domestication. This kind of interdependency between man and animal characterizes domestication as a mutual process that is not driven only by one side.

This is also the reason why genetic engineering is not the same thing as domestication by means of artificial selection. Some proponents of GMO (genetically manipulated organisms) often use the argument that the manipulation of an organism's genetic information is the same thing as domestication just made by new technological instruments. As domestication is an old, tried and tested human practice, genetic modifications are therefore argued to be safe — or even more reliable then the "raw" practice of artificial selection and breeding. However, there are still many questions linked even with the "tried and tested" phenomenon of domestication; that is, some features originate within domestic animals, in the context of culture, and subsequently play an evolutionary role in the natural context. Recently, evidence was found that the mutation in K locus responsible for melanism in North American wolves is derived from past hybridization with domestic dogs (Anderson *et al.* 2009). The main problem is that domestication seems to be, again, not only man's affair, but also a mutual relationship between both sides. And this is exactly what distinguishes biotechnology, *sensu* genetic manipulation, from the process of domestication. While domestication by artificial selection is human rational act merely in part (because its mutual character), genetic engineering pretends to be a fully rational and reflected use of technology applied by a human subject to an organic object. By means of artificial selection and breeding you will never get a green fluorescent bunny!

Various groups of animals differ in the morphogenetic plasticity of their bodies. Some animal taxa show a higher potential to develop a broader range of morphologies than others. Some animal groups are thus able to develop life-forms that may be highly derived from the usual morphology of their own lineage, but, at same time, such a deviant form may resemble the morphological characteristic of some distantly related group of animals. This is to say that particular groups of animals might possess a certain kind of imitative pre-adaptation. One may find a good example of such a "pre-adaptation" within darkling beetles (Tenebrionidae). The members of this family show immense potency to develop a variability of body-forms some of which highly resemble the formal characteristics of different beetle families. There is, however, often no selective advantage for these kinds of resemblances as they are purely formal and do not carry any additional biologically relevant meaning such as mimicry or any other kind of predator avoidance. In staphylinids (Staphilinidae; especially subfamily Aleocharinae), however, a similar phenotypic plasticity seems to find important zoosemiotic consequences. These creatures show a strong tendency to produce termitophilous and myrmecophilous forms, perhaps more than all other groups of insect together. Some of them strongly resemble termites, especially *host termite nymphs*, by means of their strongly developed physogatric abdomen that may be equipped even with pseudoappendages to make the similarity perfect (for example, *Coatonachthodes ovambolandicus*; *Spirachtodes madecassus, Austrospirachtha mimetes*; see Figure 4) (Kistner 1990; Watson 1973).

These little monsters live in the darkest darkness, deep inside termite nests where nothing can see them. They are so highly integrated into termite society that they never leave the nest: why, then, the existence of such mimicry? One possible explanation brings with it the concept of Wasman's tactile mimicry, but not all the termitophilous staphylinids show such a high resemblance to their hosts. And why would the ones that do especially resemble the host's juveniles? Is there any connection with the fact that people prefer domestic mammals with juvenile features as their home pets? It is also possible that what is preferred is just some friendly phenotype in general, and such a representation of friendly design may simply match the juvenile morphology. One way or another, this brings us to another of Wasmann's concepts: *amical selection* (Wasmann 1901, 1925; Lustig 2002), literally "selection on friends". This kind of selection prefers individuals with characters that resemble those of the one selecting. Recognizing the striking parallelisms in the relationships of ants and termites and their guests, and those between domestic animals and our selves, amical selection may theoretically explain their origins.

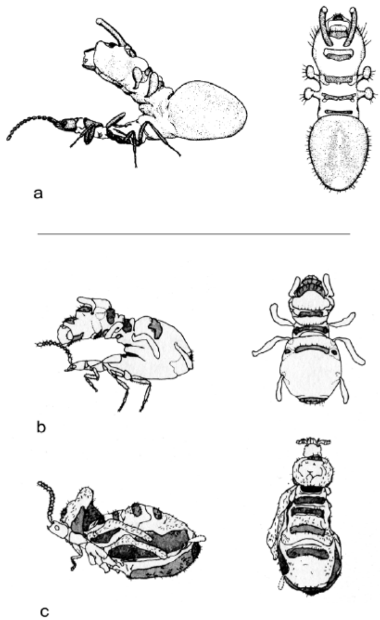

Figure 4. Schematic depiction of the three species of termitophilous staphilinids with strongly developed physogastry: (a) *Austrospirachtha mimetes*; (b) *Coatonachthodes ovambolandicus*; (c) *Spirachtodes madecassus* — lateral view (left), dorsal view (right). (a): After Watson (1973); (b+c): After Kistner (1990).

Nevertheless, it does not explain all the parallelisms in behaviour and morphology among different domesticated animals from phylogenetically distantly related groups. For example, various spotty phenotypes have emerged in different groups of domestic mammals despite the fact that there was no intention to breed new forms with such features. Especially the fact that many parallel characters have appeared in forms that have been selected for different purposes cannot be neglected. These characters are often unique for domestic animals and do not exist in wild forms (this also applies to the physogastry of the guests of social insects that never occur in their free living relatives). It seems that some domestic features repeatedly appear in different groups in response to their interaction with the human umwelt. They do not usually represent a direct adaptation to human cultural environment; rather, they represent a consequence of living together with humanity — a label which stands for being a member of domestic "family". Presumably these features emerged more or less spontaneously among different domestic animals being later co-opted as meaningful within the human umwelt, and probably also the umwelten of other co-domesticates. The perceptible surfaces of co-domesticates have been transformed into a particular semantic organ, that is among co-domesticates interpreted somewhat as "I am a friend of yours", "I am not dangerous to you" or "we belong together".

Man domesticated animals and plants; this helped to establish a cultural environment and our dependence on this life style increased irreversibly. This in turn modified our phenotypic and behavioural capacities along with those we find in domesticated form. In short, by the domestication of others we unwittingly domesticated ourselves. Humans and other creatures as "co-domesticates" rather than "masters" and their "domesticates". A long time ago it was written: "[…] they pay penalty and retribution to each other for their injustice in accordance with the ordering of time […]" (Anaximander [B1] in McKirahan 1994: 43); for co-domesticates this seems especially fitting.[1]

References

Anderson, Tovi M. *et al.* 2009. Molecular and evolutionary history of melanism in North American gray wolves. *Science* 323: 1339–43.

Belyaev, Dmitri 1969. Domestication of animals. *Science Journal* 5: 47–52.

[1] KK thanks Research Program CTS MSM 0021620845 and the GPSS Major Awards Program, a joint program of the Interdisciplinary University of Paris and Elon University. MS was supported by the project GAUK 113607/2007.

Blumenbach, Johann F. 1806. *Beyträge zur Naturgeschichte*. Göttingen: Heinrich Dieterich.

Cohen, Mark N.; Armelagos, George (eds.) 1984. *Paleopathology at the Origins of Agriculture*. New York: Academic Press.

Clutton-Brock, Juliet 1999. *Natural History of Domesticated Animals*. Cambridge, New York: Cambridge University Press.

Darwin, Charles 1859. *On the Origin of Species*. London: John Murray.

— 1868. *The Variation of Animals and Plants Under Domestication*. London: John Murray.

Diamond, Jared 1997. *Guns, Germs, and Steel: the Fates of Human Societies*. New York: W.W. Norton & Co.

Disney, R. Henry L.; Kistner, David H. 1989. Phoridae from termite colonies in Africa including two new species (Diptera; Isoptera, Termitidae). *Sociobiology* 16: 75–90.

Elgar, Mark A.; Allan, Rachel A. 2004. Predatory spider mimics acquire colony-specific cuticular hydrocarbons from their ant model prey. *Naturwissenschaften* 91: 143–147.

Friedenthal, Hans 1908–10. *Beiträge zur Naturgeschichte des Menschen*. Jena: Gustav Fischer.

Geiselhardt, Stefanie Frauke; Geiselhardt, Sven; Peschke, Klaus 2006. Chemical mimicry of cuticular hydrocarbons — how does *Eremostibes opacus* gain access to breeding burrows of its host *Parastizopus armaticeps* (Coleoptera, Tenebrionidae)? *Chemoecology* 16: 59–68.

Hammer, Karl 1984. Das Domestikationssyndrom. *Kulturpflanze* 32: 11–34.

Hemmer, Helmut 1990. *Domestication: the Decline of Environmental Appreciation*. Cambridge, New York: Cambridge University Press.

Henneberg, Maciej 1988. Decrease of human skull size in the Holocene. *Human Biology* 60: 395–405.

— 1998. Evolution of human brain: Is bigger better? *Clinical and Experimental Pharmacology and Physiology* 25: 745–749.

Henneberg, Maciej, Steyn, Maryna 1993. Trends in cranial capacity and cranial index in Subsaharan Africa during the Holocene. *American Journal of Human Biology* 5: 473–479.

Herre, Wolf 1980. Grundfragen zoologischer Domestikationsforschung. *Nova Acta Leopoldina* 52: 1–16.

Herre, Wolf; Röhrs, Manfred 1973. *Haustiere — Zoologisch gesehen*. Jena: Gustav Fischer Verlag, Jena.

Howard, Ralph W.; Blomquist, Gary J. 2005. Ecological, behavioral, and biochemical aspects of insect hydrocarbons. *Annual Review of Entomology* 50: 371–393.

Jacobson, Herbert R.; Kistner, David H.; Pasteels, Jean-Michel 1986. Generic revision, phylogenetic classification, and phylogeny of the termitophilous tribe Corotocini (Coeloptera: Staphilinidae). *Sociobiology* 12: 1–245.

Kistner, David H. 1990. The integration of foreign insect into termite societies or why do termites tolerate foreign insects in their societies? *Sociobiology* 17: 191–215.

Kleisner, Karel 2008. The semantic morphology of Adolf Portmann: A starting point for the biosemiotics of organic form? *Biosemiotics* 1: 207–219.

Kleisner, Karel, Markoš, Anton 2005. The semetic rings: Towards the new concept of mimetic resemblances. *Theory in Biosciences* 123: 209–222.

Leach, Helen M. 2003. Human domestication reconsidered. *Current Anthropology* 44: 349–368.

Lorenz, Konrad 1987. *The Waning of Humaneness*. Boston: Little, Brown.

Lustig, Abigail J. 2002. Erich Wasmann, Ernst Haeckel, and the limits of science. *Theory in Biosciences* 121: 252–259.

Mason, Ian L. (ed.) 1984. *Evolution of Domesticated Animals*. London, New York: Longman.

McKiharan, Richard B. (ed.) 1994. *Philosophy before Socrates: An introduction with texts and commentary*. Indianapolis: Hackett.

Nachtsheim, Hans; Stengel Hans 1977. *Vom Wildtier zum Haustier*. Berlin: Parey.

Portmann, Adolf 1960a. *Neue Wege der Biologie*. München: Piper.

— 1960b. *Die Tiergestalt. Studien über die Bedeutung der tierischen Ercheinung*. Basel: Friedrich Reinhardt.

— 1969. *Einführung in die vergleichende Morphologie der Wirbeltiere.* Basel: Schwabe & Co.

— 1990. *Essays in philosophical zoology by Adolf Portmann. The living form and seeing eye*. Lewiston: Edwin Mellen.

Ruff, Christopher B.; Trinkaus, Erik; Holliday, Trenton W. 1997. Body mass and encephalisation in Pleistocene Homo. *Nature* 387: 173–176.

Seevers, Charles H. 1957. *A Monograph on the Termitophilous Staphylinidae (Coleoptera)*. Chicago: Chicago Natural History Museum.

Wasmann, Erich 1890. Vergleichende Studien über Ameisen- und Termiten-gäste. *Tijdschrift voor Entomologie* 33: 27–29.

— 1901. Giebt es thatsächlich Arten, dies heute noch in der Stammesentwicklung begriffen sind? Zugleich mit allgemeinen Bemerkungen über dies Entwicklung der Myrmekophilie und Termitophilie und über das Wesen der Symphilie. *Biologisches Zentralblatt* 21: 689–711; 737–752.

— 1925. *Die Ameisenmimikry. Ein exakter Beitrag zum Mimikryproblem und zur Theorie der Anpassung*. Berlin: Bornträger.

Watson, John A. L. 1973. *Austrospirachtha mimetes*, a new termitophilous Corotocine from Northern Australia (Coleptera: Staphilinidae). *Journal of Australian Entomological Society* 12: 307–310.

Weissflog, Andreas, Maschwitz, Ulrich, Disney, R. Henry L., Rosciszewski, Krzysztof 1995. A fly's ultimate con. *Nature* 378: 137.

Williams, George; Nesse, Randolph 1991. The Dawn of Darwinian Medicine. *Quarterly Review of Biology* 66: 1–62.

Witte, Volker; Janssen, R.; Eppenstein, A.; Maschwitz, U. 2002. *Allopeas myrmekophilos* (*Gastropoda, Pulmonata*), the first myrmecophilous mollusc living in colonies of the ponerine army ant *Leptogenys distinguenda* (*Formicidae, Ponerinae*). *Insectes Sociaux* 49: 301–305.

Wrangham, Richard 2009. *Catching Fire: How Cooking Made Us Human*. New York: Basic Books.

Zeuner, Frederick E. 1963. *A History of Domesticated Animals*. London: Dowden, Hutchinson and Ross.

Чудовища, которых встречали, чудовища, которых создали: о параллельном влиянии на фенотипическое подобие в ходе одомашнивания

Существа, которые живут в условиях одомашнивания, составляют на основе морфологических, поведенческих, когнитивных и иммунологических подобий коммуникативное сообщество. Одомашненные животные живут в определенных условиях, которые существенно отличаются от начального природного окружения их диких собратьев. В данной статье говорится в основном о том, как разные качества параллельно проявились в разных одомашненных формах, которые изначально были выведены с разными целями.) Мы утверждаем, что параллельные подобия проявляются в разных группах как реакция на отношения этой группы с умвельтом определенного хозяина. С точки зрения зоосемиотики процесс одомашнивания является такой

разновидностью взаимозависимых отношений, в которой обе стороны находятся под влиянием этих отношений и в итоге трансформируются таким образом, что они становятся более «интегрированными», чем в точке отсчета.

Koletised, keda kohtasime, koletised, kelle lõime: fenotüüpilise sarnasuse paralleelsest tekkest kodustamise käigus

Olendid, kes elavad kodustatuse tingimustes, moodustavad morfoloogiliste, käitumuslike, kognitiivsete ja immunoloogiliste sarnasuste põhjal suhtluspõhise üksuse. Kodustatud loomad elavad teatud tingimustes, mis nende metsikute suguvendade algsest looduskeskkonnast oluliselt erinevad. Käesolevas artiklis räägime peamiselt sellest, kuidas mitmed omadused on ilmunud paralleelselt erinevates kodustatud vormides, mida on algselt välja valitud erisugustel põhjustel. Need erijooned on tihti omased vaid kodustatud loomadele ja metsikutel vormidel ei esine. Väidame, et need sarnasused ilmuvad erinevates gruppides paralleelselt, vastusena selle grupi suhetele teatud kindla peremehe omailmaga. Zoosemiootika seisukohast on kodustamisprotsess seda sorti vastastoime, mis mõjutab mõlemat osapoolt ning muudab neid niisugusel moel, et nad on üksteisega tihedamalt kokku kasvanud kui enne esmakohtumist.