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"Forever young": neoteny and design

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(with 6 figures)

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Abstract

The evolutionary relevance of neoteny, the concept that adults displaying youthful proportions evoke caregiving instincts, has frequently been questioned. The biological roots of the problem lead to the expression of age, sex and inheritance in size and shape. Formalist interpretations, however, can be misleading as the idea itself is anthropocentric. This weakness (in natural science) makes historic reflections on neoteny more interesting in material culture shaped by humans themselves. Archaeozoological examples include animal breeds, especially dogs. The attraction to "youthful" proportions also seems to have been exploited in both the creative and applied arts. Researchers of this eminently interdisciplinary subject cannot ignore overarching questions regarding complex and mutual interactions between nature and culture.

Keywords: ontogeny, craniology, allometry, archaeozoology, neoteny, animal breeding.

Introduction

Since the onset of domestication, animals have, more-or-less, been consciously shaped by humans through breeding regimes in captivity. In archaeology, human interference with reproduction distinguishes domesticates as true "artefacts" from their wild ancestors. Bones of hunted game may be considered undisturbed "ecofacts" characteristic of ancient natural habitats. In hunter-gatherer societies the human manipulation of wild animals is limited to signs of *peri-* and *post mortem* handling. (It is only in the last century that wildlife management began measurably influencing the morphology of red deer antlers in Europe, mirroring the ideal design laid out in the trophy scoring system of the *Conseil International de la Chasse* [CIC] established in 1930; Bartosiewicz 1999: p. 87).

Human impact on variability in domesticates was comprehensively illustrated by Charles Darwin (1868). Domestic breeds "are human creations just like ancient buildings and are living creatures just like the giant panda" (Bodó 2001: p. 3). This duality means that

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domesticates are diagnostic of culture, but are not static: they dynamically evolve along with societal constraints and needs.

Traditional archaeozoology in Central Europe was concerned with the origins of breeds. Rigid typological classifications (including those of skulls) represented an important method in these efforts in the 19th and early 20th century. Interpretations, however, often became spurious. *"The concept of race was equally applied to domestic breeds… as well as to subspecies of wild animals and human populations. This undifferentiated conceptual formation always gave rise to inadequate generalizations and growing errors"* (Pucher 2013: p. 54). Human craniological studies have not withstood the historical test of times: *Rassenkunde* became the best example illustrating the tragic consequences of short-sighted formalism.

This paper is a brief study of relationships between shape, perception and design with regard to the role of neoteny in the context of human communication.

Material and Methods

The shape of an animal is a basic component in its appearance. However, shape changes continuously through ontogeny; if static shape influences our perception of an organism, so does its dynamic change through an individual's development. By the 20th century, increasing efforts were made by scientists such as D'Arcy Wentworth Thompson (1917), Julian S. Huxley (1924, 1932), and Samuel Brody (1945) to develop and apply quantitative models reliably defining relationships between organismic size and shape. Trained in animal science, my early work was greatly inspired by their classical ideas (Bartosiewicz 1980).

Concepts outlined here will be illustrated using animal skulls photographed by the author in the reference collection of the Osteoarchaeological Research Laboratory, Stockholm University. They include the skulls of a present-day wolf (*Canis lupus* Linnaeus, 1758: p. 39), two modern dogs (*Canis familiaris* Linnaeus, 1758: p. 38) and a domestic cat (*Felis catus* Linnaeus, 1758: p. 42). The skull of the cave lion (*Panthera leo spelaeus* Goldfuss, 1810: p. 27), recovered near Ikrény in western Hungary, was photographed by Erika Gál.

Wild species and their domestic derivatives were given separate names in traditional Linnaean nomenclature. The Latin terminology used here follows recommendations by Anthea Gentry *et al.* (2004: p. 647). Palatal measurements shown in Figure 5 were defined by Angela von den Driesch (1976: pp. 42–45).

Results

A key concept relevant to this treatise is allometry, variability in shape as a function of size. Its manifestation is evident during an individual's growth and development (intraspecific allometry) and may also be observed between related species of different sizes (interspecific allometry).

Fig. 1. Intraspecific (top: juvenile dog and an adult wolf) and interspecific (bottom: adult domestic cat and cave lion) cranial allometry. Frontal aspects fitted to equal length. Scale bars equal 50 mm.

Age, size and shape

Figure 1 shows the extremes between the cranial proportions of a juvenile dog (ca 2 months old) and a fully grown wolf (top row) in parallel with comparable differences between a domestic cat and a lion. Dog and wolf, domestic and wild forms of the same

Fig. 2. Skulls of the juvenile dog (left), an adult pug and adult domestic cat (right). Frontal aspects. Scale bar equals 50 mm.

biological species, illustrate the dramatic development of shape during ontogeny. Felids display considerable interspecific size differences (GUGGISBERG 1975), offering examples of how cranial proportions differ between fully grown specimens of small and large species. The most notable feature in both examples is the great proportion and round shape of the brain case in smaller animals. Individuals of large absolute size, on the other hand, have more strongly developed snouts.

In Figure 2, the skulls of the same puppy and mature cat are shown alongside that of a pug (centre). Ancestors of this dog breed were imported from China in the 16th century to be first popularized among royalty, such as the House of Orange and the House of Stuart (FARR & MONTAGUE 1999). Representing a case of inherited *brachycephalia* promoted through breeding, skulls of adult pugs have a relatively "youthful" look: large neurocranium and extremely short snout (*brachygnathia*). This is an extreme case of neoteny, the retention of features from early ontogeny into older ages relative to ancestors or to fellow members in the same population (JONES *et al*. 1995: p. 728). According to Konrad LORENZ (1943) features of the *Kindchenschema*, the baby-like looks of juvenile creatures, motivate caregiving emotions through the "cute" appearance cultivated in neotenic breeds.

It has been a contentious issue whether affectionate response to such features is inherited (as LORENZ hypothesized) or whether it is acquired behavior built upon an evolutionary predisposition for associating affection to learned key stimuli. A recent experiment involving 122 humans has indicated that responding to neotenic looks is a critical function of social cognition. It may play a key role in caregiving and have implications for infant-caretaker interactions (GLOCKER *et al.* 2009: p. 61). While the primary perception of the *Kindchenschema* looks similar in men and women, the resulting stronger

caregiving motivation in women could have evolutionary advantages, as females act as primary caregivers in most cultures (EIBL-EIBESFELDT 1989).

In many mammalian species secondary sexual dimorphism is apparent in size, with males usually growing larger. Size thus contributes to the manifestation of sexual character in body proportions. The complex issue of human neoteny contributing to female facial attractiveness cannot be addressed here. Studies indicate however that, among other things, female models in the United States display neotenic facial proportions in comparison with a sample of "ordinary" undergraduates (JONES *et al*. 1995: p. 733). Agencies preferring such models, however, may be more driven by the objectification of women – "designing" an ideal – than by sexual selection in an evolutionary sense.

Engendered companion animals?

The cat skull in Figure 2 leads to another gender aspect of neoteny as cats have traditionally been looked upon as incarnations of stereotypical "female" characteristics. Although powerful men such as the Prophet Mohammed, General Wallenstein and Admiral Nelson are known to have liked cats (ZIMMERMANN & ZIMMERMANN 1944), heteronormative thinking frequently associates feminine manners and even male homosexuality with this companion animal (FOGLE 1981). Earl X. FREED (1965: p. 4) analyzed responses by 3,863 children (aged 8–17 years), to self-administered projective questions about which animals they would identify with. While the percent of boys and girls naming dog as their favorite were the same, more than twice as many girls as boys preferred cats. Since the survey concerned dogs in general (*i. e.*, neoteny was not considered), one may presume that the neotenic look of cats played some role in making them more popular among girls, traditionally more conditioned for caregiving roles than boys in many cultures.

In addition to being reminiscent of babies in size and shape, another shared trait of cats and neotenic dogs is that – regardless of their ages – both possess anthropomorphic facial structures, especially forward-oriented eyes. (The dark side of this cranial feature is the widely cited historic relation between cats, owls and witches; BARTOSIEWICZ 1998; NICKEL 2009).

Although the association between gender and cranial morphology is impossible to directly demonstrate using osteological evidence alone, neotenic dogs tend to play a role in female iconography, for example on two mid-14th century Gothic sarcophagi in the chapel devoted to São Cosme and São Damião in the Lisbon cathedral (BARTOSIEWICZ 2011: p. 223, fig. 17.3). Two pug-like dwarf dogs shown at the feet of a young woman of high social status are of particular interest here (Figure 3). They pre-date colonial contacts between Portugal and China by at least two centuries. Although the similarity between these statues and Early Modern Age pugs may be coincidental, the occurrence of such dogs on a tombstone dedicated to a young female seems to mirror gender-related preferences.

Fig. 3. Bell-decorated "pugs" (marked by arrows) at the feet of an unknown young woman buried along with Lopo Fernandes PACHECO and Maria de VILALOBOS in the Lisbon cathedral. Marble sarcophagus from the mid-14th century. Insert: the backward-looking dog near the left foot.

Neotenic dogs in Hungarian Antiquity

Brachycephalic dog skulls occur in the archaeozoological record in Hungary. A previously unpublished *calvarium* of a dwarf dog from the Roman provincial town of Savaria is shown in Figure 4. The precise provenance of this find within the complex urban stratigraphy remains unknown. However, it fits well within the broad morphological diversity of dogs seen at Roman provincial sites (BÖKÖNYI 1984; PETERS 1997: p. 515, fig. 1) in comparison with surrounding territories of the Barbaricum where size extremes were missing (BARTOSIEWICZ 2000).

This curious form is consonant with the idea of conscious Roman animal breeding as well as the popularity of small companion dogs at the time. Such pets could be used for little beyond self-representation in high society and possibly satisfying an emotional need for caregiving.

Even if neotenic features of the skull from Savaria are not as extreme as those of the present-day pug shown in Figure 2, it displays symptoms of inherited *brachygnathia* resulting from the arrested development of the facial region. Domestication usually meant a preference for quiet individuals with low metabolic rates, inadvertently perpetuating inherited thyroid hormone deficiency (*hypothyroidism*). This condition may be a

Fig. 4. Skull of a small dog from Roman Period Savaria, Hungary. Lateral, frontal, and basilar aspects. Scale bar equals 50 mm.

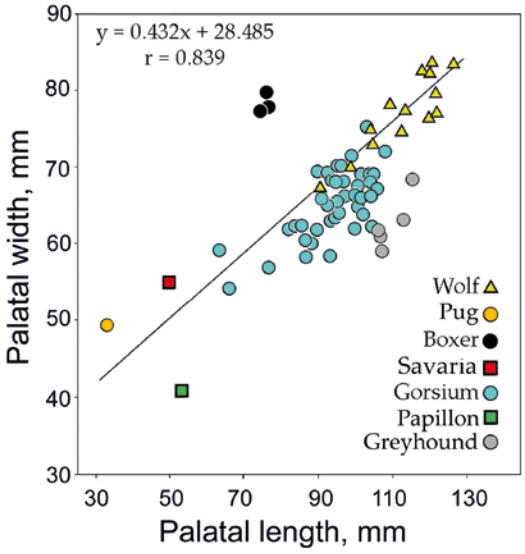

Fig. 5. Palatal proportions of Roman Period dogs and modern breeds in relation to those of present-day wolves (regression line and equation).

factor behind shortened facial features even in wild ungulates (HOY *et al*. 2011). Aside from clinically grave cases, this genetic anomaly in domesticates has been cultivated by hobby breeders.

Palatal measurements in Figure 5 indicate that Roman dogs from the city of Gorsium in Hungary (BÖKÖNYI 1984: pp. 204–205) had more elongated snouts than wolves, as shown by the cluster of data points falling below the trend line drafted on the basis of present-day wolves. Greyhounds illustrate increasing diversity in facial variability. The pug and the small Savaria specimen fall above the regression line, rivalled by only a slightly larger *brachygnathic* dog skull from Gorsium.

Following the collapse of the Roman Empire, dwarf dogs seem to have disappeared from the archaeological record in Europe. The remains of neotenic forms resurfaced

only centuries later as urban and courtly life were consolidated during the High Middle Ages and social value was again associated with the fancy of caring for such creatures (Bartosiewicz 2011: p. 225).

Perception and Imagery

D'Arcy Thompson promoted a metric approach to studying living organisms. In his seminal book (Thompson 1917: p. 719), he referred to Albrecht Dürer's "Treatise on Proportion", pointing out that the principle of coordinates *"was in common use in the sixteenth and seventeenth centuries by artists in their study of the human form"*.

Stephen Jay *Gould (1980)* reversed this idea by applying allometry to art with his 1928–1953 "evolution" of Mickey Mouse. He measured how cranial proportions of this emblematic cartoon character became progressively more juvenile along with the "domestication" of what had originally been a crude and violent figure. He emphasized that it was "*not sure that the Disney artists themselves explicitly realized what they were doing since the changes appeared in such a halting and piecemeal fashion*" (Gould 1980: pp. 262–263).

Body proportions of another cartoon hero, Garfield the cynical cat created by Jim Davis, also underwent neotenic changes between 1978–2016. My observation is that in addition to the enlarged eyes and smaller snout, his hind paws also became longer relative to a smaller body. This latter change is of special interest as the early growth of peripheral skeletal parts has been scientifically demonstrated in animal science (Pálsson 1955). Garfield's current shape is also a result of protracted changes in design implemented over 38 years.

More complex trends paralleling biological evolution have been eloquently illustrated in far more detail in the insightful paper by Erich Pucher (1999) devoted to the manifestation of classical evolutionary principles in the development of locomotives. That study is a tangible illustration of the subtle interplay between pressing practical needs (laws of physics, geopolitical parameters) and human creativity (economic decisions, design and fashion) the dual forces defining the size and shape of engines. His important analysis is also a reminder that while parallels between nature and culture abound, measure and prudence are imperative in their scholarly interpretations.

Within the context of neoteny, this sober, "technological" approach offered a new perspective on the assertion by Konrad Lorenz (1943) that even objects may acquire emotional value by association with human morphological features. Working with the development of domestic breeds as material culture, it was not difficult to expand the idea of neoteny to inorganic design. Figure 6 shows formal parallels between cranial neoteny illustrated in previous figures and two emblematic car models. Such striking similarities in form cannot be imagined without their emotional impact, an indispensable force in successful marketing. Although no metaphoric animal names used in the car industry refer to age, extreme chassis shapes compared in this figure are typical of a range of models, and not only in the early 1960s.

Fig. 6. Neotenic features of a Fiat 500 (1967, left) in comparison with a Porsche 356B Coupe (1962), comparable to the cranial proportions of the pug (Figure 2) and wolf (Figure 1). Lateral views, not to scale.

"Cute" economy car models evoking animal metaphors were popular in 20th century European car manufacturing, the best examples being affectionately referred to as the *Käfer* (beetle in German: Volkswagen Typ 1) and *deux chevaux* (two horses in French: Citroën 2 CV). While the shapes of these two classics are clearly neotenic, their popular names borrowed from the animal world bear no reference to the concept itself.

Interestingly, aside from a classical high-status car bearing the name of a top feline predator, Jaguar, animals associated with aggression are not openly expressed in animal-inspired car brands. However, the concept seems implicit to the "anti-neotenic" design likened to the wolf skull in Figure 6 that can be observed in the basic shape of many sports cars. Oversized engines and minimized cabin size make these models reminiscent of the cranial proportions (large viscerocranium, small neurocranium) of fully grown animals.

Conclusions

Archaeozoology, a study of animal-human relationships, comprises the evaluation of animal remains. On the level of interpretation, however, it also requires research into past and present human-human relationships through the mediation of animals: the use of animal metaphors and symbols has always reflected human needs and aspirations ranging from simple nourishment to diverse forms of social self-representation.

Critics have pointed out that neoteny as a biological theory is *"largely, if not totally, a bankrupt concept"* (SHEA 1989: p. 97), in part owing to its anthropocentric nature. Naïve early speculations ranked human races and sexes on the basis of cranial forms. For example, Causasian females were seen to be at the same evolutionary level as African men or

white children (Haeckel 1867). This degree of formalism would be unacceptably racist and sexist today and is another example of the previously mentioned misconceptions in biology (Pucher 2013: p. 54).

On the other hand, "applied neoteny" manifested in human-made design, ranging from animal breeds to artwork and industrial forms, reveals the very anthropomorphic nature of neoteny. The *Kindchenschema* seems a recurring motif in Western culture, planned to invoke positive emotions originally associated with its biological interpretations. Lifeless objects may gain emotional content from our instinctive reaction to juvenile form (Lorenz 1943). The reasons behind this reaction are complex and manifold. Cars, often ascribed personalities by their owners, represent a group of products whose shapes may play on neoteny rather directly. Forms of shoes or furniture would be more difficult to characterize this way. It would be interesting, however, to find archaeological examples illustrating the phenomenon outlined in this brief study.

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