Appendix: Environmental Enrichment or Enrichment

This short appendix is not meant to be a comprehensive account of the zoo management technique called either environmental enrichment or, more simply, enrichment. Instead, it aims only at assessing it from the ontological standpoint adopted in this book, namely, that zoo animals are immurated animals, a new type of domesticants in the making.

Let us begin by stating what environmental enrichment is through the words of one of the world's leading experts on the subject:

> 'Environmental enrichment is a process for improving or enhancing zoo animal environments and care within the context of their inhabitants' behavioural biology and natural history. It is a dynamic process in which changes to structures and husbandry practices are made with the goal of increasing the behavioural choices available to animals and drawing out their species-appropriate behaviours and abilities, thus enhancing their welfare. As the term implies enrichment typically involves the identification and subsequent addition to the zoo environment of a specific stimulus or characteristic that the occupant/s needs but which was not previously present. (American Zoo & Aquarium Association, 1999)'. In practice, this definition covers a multitude of innovative, imaginative and ingenious techniques, devices and practices aimed at providing adequate social interaction, keeping animals occupied showing an increased range and diversity of behavioural opportunities, and providing more stimulating and responsive environments. Examples range from naturalistic foraging tasks, such as the ubiquitous artificial termite mound, puzzle feeders constructed from PVC pipes, finely chopped and scattered food, novel foods and carcasses, to objects that are introduced for manipulation, play and exploration, novelty and sensory stimulation. Appropriate social stimulation, both within and between species, and even training can be considered as enrichment. On a larger scale, the renovation of an old and sterile concrete exhibit to provide a greater variety of natural substrates and vegetation, or the design of a new exhibit that maximizes the opportunities for natural behaviours, are also considered as environmental enrichment.
>
> (Shepherdson, 2003, p. 119)

From Shepherdson's account above, one may tease out the following theses:

1. It is regarded by its practitioners to be in accordance with the philosophy of promoting animal welfare.[1]
2. It tacitly acknowledges that the zoo environment is very different from the wild environment; we have seen that in the latter, animals have to fend, hunt/forage for themselves while in the former, all services are laid on as far as food, shelter and protection from danger go.

3. It recognises that the animals are bored by the zoo environment, and hence the need to provide for opportunities to stimulate the bored animals.[2]
4. It implies that it is Janus-faced, that is to say, it looks back to the animals's 'behavioural biology and natural history' as well as to the present and the future with regard to their behaviour in their new exotic environment.

In other words, it is at the very centre of the procedures and processes of transforming the inmates to becoming immurated animals, to becoming domesticants. While recognising that the animals carry with them a biology and a natural history peculiar to the species which have evolved naturally in the wild, it also recognises that zoos cannot satisfy the needs which arise from that biology and that natural history in the same way as their ancestors or their wild counterparts can satisfy them in the wild. It cannot do so for two reasons: (a) the simple contingent one that the zoo environment is utterly different from their natural habitat; and (b) the theoretical and logical one that zoos cannot meet the needs of the animals in the way their ancestors meet theirs without abolishing zoos themselves, and returning the animals to the wild. Hence zoos offer naturalistic environments, naturalistic foraging and hunting instead.

As this book has demonstrated, zoo experts and managers hold that zoo animals are 'wild animals in captivity', but such a claim is conceptually speaking an oxymoron, and ontologically speaking wrong-headed and totally misleading because wild animals are naturally occurring beings, whereas zoo animals are biotic artefacts, the ontological foil to the latter. These deep-seated flaws are reflected in the programme and techniques of environmental enrichment which, as we have just remarked, are Janus-faced. In turn, these techniques for ameliorating boredom and thereby improving the welfare of the animals serve to hasten the procedures and processes of transforming them into biotic artefacts, to being domesticants. Over time, as the animals adapt to and evolve within the context of selection for captivity, zoo experts, too, would evolve their techniques of enrichment such that they will increasingly be less and less naturalistic and more and more oriented to human culture rather than to animal culture as found in nature amongst animals living in the wild.

According to Shepherdson (2001) and others, an enriched environment should allow the animals to perform 'natural behaviours' implying that the behaviour of animals in zoos are 'unnatural' or 'abnormal'. But what counts as 'unnatural or abnormal behaviours'? In the widest sense of 'abnormal' or 'unnatural', all behaviours of zoo animals may be said to be abnormal or unnatural – eating zoo pellets as much as playing with plastic toys are abnormal or unnatural, as such behaviours are not found amongst animals-in-the-wild. The kinds of 'abnormal/unnatural behaviour' which zoo experts are keen to eliminate are those which appear to indicate that the animals under their charge are unhappy, such as stereotypic behaviours. That is why one clear goal of environmental enrichment is to improve their psychological well-being as well as physical welfare.[3] Take the case of chimpanzees and the oft-quoted termite mound. In the wild, chimpanzees have been observed to fish termites out of a termite mound with a stick. So, zoos provide the chimpanzees with an artificial termite mound, not, however, containing termites which the chimpanzees can fish out with a stick, but pie fillings, mustard and other Macgoodies instead. This enrichment, undoubtedly, serves to amuse and distract the chimpanzees, thus preventing them from performing stereotypic behaviours

out of boredom. It does not, however, instantiate the natural behaviour of chimpanzees in the wild; these actually use a stick to fish out live termites from the termite mound which they have found for themselves, not out of boredom, but as part of their search for food in order to survive. To say the least, pie fillings and mustard are not part of the diet of chimpanzees in the wild. The mound is artificial, without the smell, the texture of a real termite mound in the wild; the Macfoods are mere snacks for which the chimpanzees have, unfortunately, developed a taste. Macfoods are known not to do humans any good; it is also unlikely to do good to the captive chimpanzees, whereas the termites, which chimpanzees in the wild adore, are of significant nutritional value to them. The two contexts are so fundamentally and utterly different from each other that it would be grossly misleading and grotesque to say that fishing for Macfoods from an artificial termite mound in a naturalistic enclosure with human visitors gawping at them is an instance of 'natural behaviour' as performed by chimpanzees in the wild.

It would be better explicitly to admit the ontological gulf between the two contexts and simply adopt whatever techniques zoo managers and experts can devise in order to keep boredom at bay as far as their charges are concerned. So why not, then, opt not for 'natural behaviours' and naturalistic analogues but simply for the most effective way(s), which in certain contexts can be the most charged with human culture? Let's go back to the chimpanzees. Why not allow them to play with computers, even to play with specially devised computer games, if these can be taught to them? Immurated chimpanzees, after all, are part of human culture; it would be in keeping with that logic to let them be exposed to the latest developments in hi-tech should such exposure achieve at least two of the three desired goals of the enrichment programme as outlined by Shepherdson (2001), namely to improve the psychological (and physical) well-being of zoo animals as well as to render them more interesting to zoo visitors.[4] The same goes for elephants. Elephants in the wild do no painting. But elephants in zoos, who are bored out of their minds, should be given access to paint pots and a large canvass, so that they can have a whale of a time tossing the pots and the paint at the canvass with their trunks, thereby creating at the same time works of elephant 'art', which the zoos can auction to the highest bidder – surely, a win-win situation for all the parties concerned, the elephants, the visitors and the owners of the elephants. Of course, it is true that in tossing the pots the elephants are doing something 'natural', so it counts to that very limited extent as 'natural behaviour', since it is with the same trunk and the same action of tossing that the elephants use to toss the pots as their wild counterparts would to toss an offending human against a tree trunk in the wild. But again, the two contexts are so different in ontological character that it would be highly misleading simply to say that the one is as 'natural' a behaviour as the other.

The logic of the above perspective leads to a conclusion which would make zoos more like circuses. Of course, circuses are often condemned for the cruelty of the methods used in training animals for their acts; reputable zoos, undoubtedly, would be against cruelty in any of the methods and devices they use in their enrichment programmes. Furthermore, it offends our human sensibility to see animals in circus acts dressed up in human clothes; reputable zoos, today, do not impose human accoutrements on their animals. However, these important differences apart, the similarities between them remain striking. The performing whales, each indifferently called Shamu, are a case in point. If one must keep

whales in aquaria, then one, at least, ought to make sure that they are not bored out of their minds; what better means of making their lives more meaningful than to train them to enter into a relationship with their keepers/trainers who, seemingly without cruelty, manage to get them to perform according to their orders, by making use of movements they would 'naturally' use if they were living wild lives in the wild? Looked at from such an angle, and bearing in mind that these animals are not 'wild animals in captivity' but immurated animals which are on the way to becoming domesticants, there is nothing odd or uncomfortable about their trained behaviour. Their trained behaviour is only odd and uncomfortable to behold if one mistakenly holds them to be wild animals. Similarly, the orang-utans who have been trained to slide down the vine to greet the human guests gathered in their enclosure for breakfast are not all that different from cats and dogs which go into the kitchen to greet their owners when they saunter down for their breakfast. The orang-utans do not appear to be unhappy doing their act; on the contrary, the act is part of the enrichment programme designed to make life less boring for them. Zoos may come to displace circuses as the more acceptable face of training animals to perform acts which appear both to amuse the animals as well as their human spectators. Now, of course, circus trainers have long maintained that their training also plays such dual roles; however, circuses carry a burdensome past which makes it difficult for them to convince modern sensibilities that their methods are those that the philosophy of animal welfare could endorse with a clear conscience, whereas zoos are in a better position to do this PR job.

The direction towards which the analysis points reflects the shift in terminology from 'environmental enrichment' to 'enrichment'. The former conjures up artificial trees and branches in enclosures from which monkeys could swing; it attempts to provide a naturalistic environment for the animals and thus to lessen their boredom by making it possible for them to swing from branch to branch. The latter conjures up the chimpanzee amusing itself with a computer, which focuses on the animal and attempts to lessen its boredom by providing whatever devices or situations that happen to work. The simpler term looks forward to active training – usually involving a close and intimate relationship between the human trainer and the animal – as a means to improve the psychological well-being of immurated animals, while the more restrictive term appears to focus more on improving the physical welfare as well as the psychological well-being of such animals by making their physical environments more naturalistic.

Conclusion

The concept of environmental enrichment or enrichment tacitly acknowledges that zoos are exotic environments for exotic animals. It is at the centre of those procedures and processes under immuration to transform animals to becoming new kinds of domesticants. The logic of environmental enrichment leads to the logic of enrichment. Under that latter logic, the distinction in theory and principle between circuses and zoos would be difficult to make, as both may claim that they are enriching the existence of the animals under their charge as well as enriching us human spectators who watch the animals performing their trained acts.

Notes

Introduction

1. Ontology is that part of philosophy which deals with being, with different kinds of being in the universe. For instance, God, the devil, angels and demons are supernatural, transcendent beings; Hamlet and Anna Karenina are fictional beings; Michael Jackson and Prince Charles, on the other hand, are flesh and blood individuals whom, in principle, one can meet face to face and whose hands one can shake. The latter are material beings, with space-time co-ordinates, even though they may not be wholly physical beings. In contrast, fictional and supernatural beings are, *ex hypothesi*, non-material, non-physical beings. If someone literally claims to have met Anna Karenina in Russia and kissed her hands, that person runs the risk of being incarcerated in what was once called a lunatic asylum. Of course, some people in history have also seriously claimed that they have seen God, that they have spoken to God, or that God has spoken to them – atheists regard such people to be equally suffering from delusions, but religious believers consider them to be very special individuals whom they call mystics.
2. There is more than one sense of tame. 'Immurated' is a term coined to refer to zoo animals, the detailed meaning of which will be explored, in due course, in the book.
3. Note that the operative phrase here is: 'the suspension of the mechanism of natural selection within the context of natural evolution'. We shall see in later chapters that natural selection does operate in contexts outside of natural evolution, such as in the context of zoo management and domestication. The crucial difference between them is that while the former leads to the emergence of naturally occurring living beings, that is, wild animals in the wild, the latter leads to the emergence of biotic artefacts, the ontological foil to wild animals in the wild.

1 What does the public find in Zoos?

1. Some of the issues raised in this chapter may be found in an earlier article – see Lee, 1997b.
2. The ontological significance of this will be explored in Chapter 4.
3. In contemporary literature in ethics, there are three main types of ethical approaches:

   (a) Consequentialist: The most often invoked of which is utilitarianism. Consequentialism considers an act to be right only if its good consequences turn out overall to outweigh its bad consequences. In other words, the notion of good logically precedes that of right.

(b) Deontological: The Kantian variety has been long dominant in modern Western moral philosophy. Deontology considers an act to be right irrespective of its consequences, emphasising the motive of the act. In other words, the notion of right is central to ethical discourse, and not that of good.
(c) Virtue ethics: The Aristotelian variety is most often invoked; it considers character of the agent to be at the heart of ethics, not so much the agent's acts.

For details, see Baron, Pettit and Slote (1997).

4. The term 'morally considerable' primarily refers to beings which we humans deem to have moral needs or to be the bearer of moral rights in virtue of the fact that they possess certain relevant empirical characteristics, such as sentience or mental life.
5. See also Rachels (1991).
6. The term 'human chauvinism' was coined by Richard Routley (Richard Sylvan) (1973) to draw attention to and critically question the anthropocentrism (human-centredness) deeply embedded in Western moral philosophy. Human chauvinism considers human beings alone to be morally considerable.
7. Of course, there are a few zoos which specialise in exhibiting domesticated animals.
8. According to *The World Zoo Conservation Strategy* (1993): 'It is difficult to estimate the total number of animals and species in zoos (5.1).' It only gives the world total of zoo vertebrates as 1 million animals.
9. I owe this point to Mary Midgley.
10. For an account of classical and molecular genetics, see Lee (2005a).
11. As we shall see in a minute, Darwinian evolution and natural selection must not be understood in terms of what Karl Popper has called 'passive Darwinism', that is to say, as if it implies that 'organisms are the mere playthings of fate, sandwiched as it were between their genetic endowment and an environment over which they have no control' (Rose, 1997, 140).
12. On the themes of time and space in biology, apart from Rose (1997), see also Mayr (1982, 71).
13. On reciprocal causation, see Dickens and Flynn (2001); on its equivalent, non-linear causality, see Lee (1989).
14. In Chapter 9, we critically look at genetic reductionism and show that it is methodologically wrong-headed in the context of *ex situ* conservation of endangered species, a flaw which undermines a key role, if not the key role, assigned to zoos by bodies like the World Zoos Conservtion Strategy (1993) and the European Union Zoos Directive (1999).
15. On ecocentrism, see Rolston (1988). In contrast, the philosophy of animal welfare as well as of animal rights are explicitly biocentric in outlook, that is to say that the focus is on the individual animal which is capable of suffering or which actually suffers pain on the one hand, or which is the subject of a mental life on the other. Such a fundamental difference in theory/philosophy between ecocentrism and biocentrism is bound to have implications for policy-making. For instance, the former may not object to letting animals die of hunger under unusually harsh weather conditions, provided they are not

anthropogenic in origin (not caused by humans), whereas the latter would be in favour of saving those individual suffering animals.

Natural biodiversity should be distinguished from another kind which is artefactual, not natural, in character. (See Lee, 2005a and 2004.) One of the main burdens of this book is to argue that zoos are well placed to create artefactual biodiversity and that they are ontologically misguided in claiming that one of their important aims, if not the most important, is to save extant threatened natural biodiversity through their programme of captive-breeding and *ex situ* conservation – see Chapters 9, 11 and Conclusion.

2 Animals in the wild

1. Note, however, that this historical fact of evolution hides two very different types of phenomena which ought to be distinguished – vertical evolution where there is change but without speciation and evolution which involves speciation. According to E. O. Wilson (1994), Darwin was primarily concerned with the former, not the latter – for instance, a genetic mutation in a population of white moths which happens to bestow survival advantage could end up by being one with predominantly black moths. There has been change but no speciation; you start and end with one species. However, Darwin's account of finches in the Galapagos is an instance of vertical evolution with speciation.
2. This is in contrast to the theory of creationism (popular amongst certain fundamentalist Christians) which holds that there is intelligent design in life forms, present and historic, and that God is that intelligent designer and creator.
3. According to Mayr (1982), this is the kernel of truth behind population thinking in biology – that individual (sexually reproducing) organisms are unique, that there is no 'typical' individual, and that mean values are abstractions. Natural selection works on such unique biological individuals.

   The notion of ecosystems is central to ecological thinking. Very briefly, an ecosystem is that ensemble of biotic and abiotic components which interact in a causally reciprocal manner, of which, of course, the animals form an integral part. The boundaries of ecosystems may not be easy to delineate in all cases, but by and large, there is consensus where the limits may be usefully drawn. One should also bear in mind that ecosystems are dynamic, not static in nature. See, for example, Botkin (1990); Botkin and Keller (1995).
4. Apparently, the age of *Homo sapiens* could then be followed by the age of rodents, as these animals can take refuge underground during a nuclear holocaust; moreover, they are better able to withstand radiation than humans and other mammals, should they be exposed to it.
5. For a full exposition, see Lee (1999).
6. See Maturana and Varela (1980) for the introduction of the term 'autopoeisis'.
7. Note that this sense of autonomy has nothing to do with the Kantian sense of autonomy of the (human) will.
8. However, in Chapter 8, we will argue that the intimate ontological link in an organism between existing 'by itself' and 'for itself' has finally been dramatically ruptured by biotechnology – transgenic organisms exist neither 'for themselves' nor 'by themselves'.

9. For example, a mammalian species on average lasts a million years; this kind of extinction is entirely natural, non-anthropogenic, that is to say it is not caused by humans and their activities.
10. There are obviously other senses of the term 'nature' which will not be considered here. For a thorough and detailed clarification of the different senses, see Lee (1999) or Lee (2005b) for a briefer account. Lee (1999) also argues that the distinction between the natural on the one hand, and the artefactual on the other is fundamental given that there are entities in the universe (or more narrowly construed in our solar system) which are totally independent of humans and others, which are the direct products of human intention, ingenuity and manipulation. However, the distinction is meant, in philosophical terms, not as a dualism (in the Cartesian sense) but as a dyadism. Examples of dualisms are: mind/body, male/female, human/ non-human, where the first term mentioned in each set is considered to be superior or to belong to the master class, while the second term refers to an inferior or slave class. The dyadism – naturally occurring/(human) artefactual – which this book is basically concerned with, has no such hierarchical connotations; the dyadic distinction is simply necessary to an understanding of the history of Earth and of life in general on it on the one hand, and of the role played by *Homo sapiens* on the other. Humans belong to a species which happens to possess a unique kind of consciousness, enabling it to develop not only language but also very powerful technologies for transforming the natural to become the artefactual. In other words, human technology makes it possible for humankind to manipulate nature in order to make it embody human intentions and ends. The dyadism in question therefore has ontological import (but has no hierarchical import in terms of superiority or inferiority). The categories of the naturally occurring on the one hand, and the artefactual on the other are distinctly different, ontologically speaking – the former has existed and (in principle) continues to exist and will eventually go out of existence in the absence of humankind, while the latter exists, continues to exist and will exist only as long as humankind itself exists.
11. Chapter 7 will look at the issue whether animals in zoos could be said to be domesticated animals and, if so, in what sense of that term; Chapter 8 will explore the notion of zoo animals as biotic artefacts.
12. For details on the science, philosophy and technology of genetics, see Lee (2005a).
13. Chapter 8 will look more closely at the notions raised here.
14. See Irwin (2001).
15. Three theses of teleology (of which intrinsic/immanent teleology is one) will be distinguished and characterised in greater detail in Chapter 8.
16. The emperor penguins (*Aptenodytes fosteri*) in Antarctica breed during the Southern winter. After a few weeks of courtship, the female lays an egg and then sets off to the sea to feed herself (travelling up to 50 miles or 80 kms), leaving the male, famished for as long as 65 days in the hostile Antarctic environment, to guard and keep the egg warm, and eventually to hatch it. At the end of that long period, the female returns, 'miraculously' recognises her family and immediately starts to feed the recently hatched chick by regurgitating food from her stomach; whereupon her mate leaves straightaway, on his equally long journey, to replenish and refuel himself at sea. See Rockliffe and Robertson (2004).

17. To make empirical and conceptual sense of this kind of phenomena requires the so-called biological-species concept which may briefly be defined as follows: 'a species is a population whose members are able to interbreed freely under natural conditions' (Wilson, 1994, 36). However, this is not to say that the concept is without difficulties. For instance, it is not applicable to organisms (mainly plants) which reproduce asexually.
18. This refers to the deep themes set out in Chapter 1 of the biology of time and history as well as of the biology and philosophy of reciprocal causation of organisms-in-the-environment.
19. See http://www.polarbearsinternational.org [01/12/04]
20. The evolutionary-species concept is different from the biological-species concept which will be raised again in Chapter 8. In other words, there is no one single meaning/definition of species which can do justice to the notion in all the contexts in which it is invoked. One needs to distinguish, at least, between these two different, though related, understandings of the notion. For a fuller discussion of this and related matters, see Mayr (1982, pp. 256–75, 286–7, 295–6). See also Ereshefsky (1998).
21. The token/type distinction will be raised again in Chapter 8, but in the context also of biotic artefacts, as well as assessing whether a biotic artefact such as a captive animal in a zoo could be a said to be a token of a naturally occurring species in the same way a wild animal in the wild may be said to be a token.
22. The variations are both phenotypic and genotypic. Today, with regard to the latter, scientists, in studying the genomes of various species, can ascertain with precision what constitutes the genetic variations between individuals of the species – in the case of the human genome, they have identified what are called SNPs/snips, that is, 'single nucleotide polymorphism'. A SNP represents a DNA sequence variation amongst individuals of a population. SNPs promise to be a money-spinner as they can be used to identify individuals who could be vulnerable to diseases like cancer.
23. After all, as we have earlier remarked, a peacock and a peahen hardly look alike; nor does a caterpillar look like the adult butterfly.
24. There are in fact three species in the wild today: one Asian (*Elephas meximus*), two African – African savannah (*Loxodonta Africana*) and African forest (*Loxodonta cyclotis*).

3 'Wild animals in captivity': is this an oxymoron?

1. A more recent volume is Kleiman, Allen, Thompson and Lumpkin's (1996) *Wild Animals in Captivity*.
2. Increasingly, professionally accredited zoos make it their official policy to use as exhibits zoo-bred animals and would only sanction in exceptional cases the import of animals freshly caught from the wild. In such reputable zoos, only the last two categories of animals would, presumably, form part of their respective collections of exhibits.
3. Of course, 40 years after the event, should the man still be incarcerated, most people in society would say that he should be released especially when his character might even have changed during those long years of imprisonment and he is no longer that dangerously violent man in prey of women. However, the matter is then one of justice and morals, not of conceptual

sense, provided one changes the tense by referring to him as that man who was once dangerously violent denied his freedom and under captivity. Analogously, one could say intelligibly, using the past tense, that this animal under captivity in a zoo was once a wild animal; however, what one cannot intelligibly say, as the arguments in this chapter show, is that such an animal is a wild animal in captivity. The latter is precisely what zoos want to say.

4. As we shall see, animals under long-term captivity could weigh much more than their counterparts in the wild.
5. From now on, whenever appropriate, the term 'animal-in-the-wild' rather than 'animal in the wild' will be used in order to emphasise that the property of wildness in animals can neither be understood apart nor is it detachable from the animal's existence in the wild, as well as to highlight the conceptual incoherence of the term 'wild animals in captivity'.
6. Here is a brief biological summary of tameness and taming, according to one leading zoologist on the subject of domestication:

> Reduced flight distance in the presence of people is one of the most obvious behavioral changes accompanying the domestication process. . . . The degree of tameness attained is heavily influenced by the animal's experience with people. Tameness is facilitated when people become associated with positive reinforcers such as food or pleasurable tactile contact. . . . they are stressed less by interactions with people and may experience greater reproductive success and productivity. Researchers selecting for tameness in wild silver foxes . . . have found predictable changes in the activity of the serotonergic and catecholamine systems of the brain. . . . Overall, tameness is becoming one of the better understood behaviours associated with the domestic phenotype.
>
> (Price, 2002, p. 129)

Price also points out the tameness is the single most important effect of domestication of behaviour:

> the single most important effect of domestication on behaviour is reduced emotional reactivity or responsiveness to fear-evoking stimuli (i.e. environmental change). This characteristic is observed in virtually all populations of domestic animals and pervades a wide variety of behavioral responses to both the social and physical environments (e.g. intraspecific social interactions, reactions to the presence of humans, responses to novel objects and places). Reduced responsiveness to fear-evoking stimuli is seen as an adaptation to living in a biologically 'safe' predator-free environment with: (i) limited opportunities for perceptual and locomotor stimulation; (ii) frequent invasions of personal space, with little opportunity to escape from dominant conspecifics; and (iii) frequent association with humans, who are prone to cull untamed and intractable individuals. Available information supports the hypothesis that individuals less reactive to fear-evoking stimuli experience reduced levels of stress in captivity, greater reproductive success, greater productivity (e.g. growth rate, animal products) and are handled by humans with greater ease. . . . It is not surprising that one biological trait can be so important to the domestication process. Consider the importance of emotional reactivity to the fitness of animals living in nature.
>
> (Ibid., p. 180)

7. The dodo, because of its evolutionary history, had not encountered enemies which it had to fear, least of all humans; it did not develop flight reaction, nor escape distance. As a result, it became extinct when humans arrived in their habitat, killing them with ease.
8. Hediger (1968, p. 43) also points out that the animal-in-the-wild is capable of assessing very finely and precisely the situation it finds itself in the context of exercising its flight reaction. For instance, an antelope would not necessarily display such a reaction every time it meets a lion; if it judges that its normal predator has already just dined handsomely, it would nonchalantly ignore its presence.
9. Furthermore, Hediger goes on to note perceptively that '(m)an is moreover the only creature able to free himself from the elementary function of escape. By this self-release, man clearly stands apart from the rest of creation, and, as the arch-enemy, is the focus of all animal escape reactions' (1968, p. 49).
10. In recent zoo literature, the term 'tame'/'taming' seems to have dropped out of usage. Instead, it talks of 'desensitization', which in part, if not completely, refers to the same thing. See the following example:

    > The first step in teaching an animal to allow husbandry procedures to be performed consists of desensitizing the animal to human touch . . . Another important aspect . . . involves using desensitization techniques to reduce an animal's fear responses to unfamiliar objects and uncomfortable procedures.
    > (Kuczai II et al., 1998, p. 319)

11. Obviously, domestication which leads to domesticants such as cats and cows involves more elements than taming. The point made here is simply that taming is an essential first step in ultimately producing domesticants or domesticated animals.

    It may be worth drawing the reader's attention to another related matter. Reindeer and yaks are tame, but they are not domesticated animals or domesticants. Some writers have called such animals 'domesticated animals' but not 'domesticants'. This author chooses to use the terms 'domesticated animals' and 'domesticants' interchangeably and would just simply refer to reindeer and yaks as 'tame' which is the antonym of 'wild' in one sense of 'wild'; it follows that reindeer roaming in the Artic north are wild in other senses of 'wild', which is made clear in this book. In other words, 'domesticated animals/domesticants' mean more than just 'tame'; 'wild' means more than just 'untamed', though for an animal to become tame is an essential first stage – a necessary though not sufficient condition – in its transformation to a domesticated animal; for an animal to become tame is to lose one aspect of being wild, though not all.
12. Philosophers talk about the distinction between surface and depth grammar in the following way:

    A1. Sunday of by the way great.
    A2. Sunday is the Muslim holy day.
    A3. Sunday is the Christian holy day.
    A4. Sunday is large in girth.

    A1 is unintelligible at the level of surface grammar as it is not a properly constructed sentence in English. In contrast, A2, A3 and A4 are intelligible at the

level of surface grammar because each is a properly constructed sentence in English. A2, though intelligible, happens to be false (if the sentence were to be uttered) while A3 happens to be true. However, it would be inappropriate to say of A4 that it is either true or false, as it is unintelligible at the level of depth grammar – it just makes no sense whatsoever to apply the attribute 'large in girth' literally to Sunday, when Sunday is the name of a day in the week. (Of course it would make sense if 'Sunday' refers to a child, the son of Joe Blogg.)

4 Decontextualised and recontextualised

1. However, it remains true that the public, by and large, are mainly interested in charismatic animals like the lion, the tiger, or cuddly ones like the panda.
2. At least, that is, one of the three species of elephants found in zoos comes from India, the other two from Africa.

   It is true that, historically, the jaguar's home range extended to some of what we today call the southern states of the USA, such as Arizona.
3. Historically, capturing wild animals from the wild to make them residents of zoos also went hand in hand with breeding such animals in captivity; of course, the earlier historical motive for doing the latter is different from the contemporary one which, as Chapter 9 will critically examine, heroically focuses on the goal of saving endangered animals-in-the-wild from extinction. The zoo venture in both aspects began in the nineteenth century in several European zoos – London, Antwerp, Marseilles, Turin – during a period when European imperial power was at its height, making it possible in the first instance for agents from such countries to capture animals-in-the-wild from various parts of their respective colonies, thereby rendering the animals exotic. This set of dislocations involves two things: acclimatisation or naturalisation as well as domestication, which would enable zoos to produce beasts that could be put to work, or crossed with indigenous ones to produce larger and more vigorous versions. (See Baratay and Hardouin-Fugier, 2002.)

   For a discussion of climate on captive animals, see Price (2002, ch. 16).
4. See Appendix for a brief critical exploration of the notion of environmental enrichment.
5. It would be boring and tiresome here to point out once again the unintelligibility of the phrase 'all zoos exhibit living specimens of wild animal species'. The reader should take it as read that, as far as this book is concerned, phrases such as that or similar about the so-called 'natural behaviour' of zoo animals in zoo environments which may occur as part of quotations from zoo literature, are all objectionable.
6. See Baratay and Hardouin-Fugier (2002).
7. This dramatic, theatrical style of exhibiting animals was pioneered by Hagenbeck:

   > The panoramas, for which Hagenbeck had received a patent in 1896, were made up of a series of enclosures, laid out like theatre stages, each one behind and slightly higher than the other and separated by hidden moats. Artificial rockwork and plantings concealed the holding quarters and service ways. . . . The obscured moats, dramatic rockscapes, and numerous ponds and lakes created scenes of expanding vistas in the most audacious zoo

> development to that time. The African panorama was the first to generate the illusion of an open savanna, populated with gazelles, flamingos, storks, cranes, antelopes, zebras, lions, and in the distance, ibexes and wild sheep on rocky outcrops.
>
> (Hancocks, 2001, pp. 66–7)

An earlier but no less colourful way of presenting an animal as an exhibit may be found:

> [w]hen (Charles X of France) received a giraffe as a gift from . . . the Ottoman viceroy of Egypt, in the summer of 1827, he arranged for her to wear a cape embroidered with the French fleur-de-lis and the Egyptian crescent on her walk from the docks in Marseilles to Paris. . . . the giraffe's winter quarters were quite elegant, with parquet flooring and the walls insulated with an 'elegant mosaic' of straw matting: 'truly the boudoir of a little lady,' wrote Geoffroy Saint-Hilaire.
>
> (Ibid., pp. 33–4)

8. At first sight, this charge appears unwarranted. For instance, he has a point when he says:

> Observing animals in a zoo is often closer to reality when compared with other media, for example film. In a zoo, a pride of Lions . . . rests and sleeps for most of the day, just as it would on the African savannah, whereas in a 50-minute-long television programme the Lions are often shown being active for the majority of the time. Therefore, a visit to the zoo provides a more realistic representation of the daily life of a Lion than an edited film programme.
>
> (Andersen, 2003, p. 77)

However, in a later chapter, it will be argued that such a view is at best superficially correct.

9. Chapter 9 will examine these claims from the viewpoint of their mutual compatibility in the light of the ontological exploration pursued by this and following chapters.
10. This argument will be examined in detail in a later chapter.
11. As a result, most animals spend most of the time, throughout the year and especially all nights in barren cages, where they have to put up with a great deal of noise produced by the clanging of steel panels reverberating through the walls – see Hancocks (2001, p. 141).

    The cost of creating Jungle World at Bronx Zoo in 1985 was $9.5 million while that of creating Penguin Encounter at Sea World in San Diego in 1983 was $7 million.
12. One such naturalistic exhibit, commonly acclaimed to be the best of its kind, is Jungle World at Bronx Zoo, New York, which opened in 1985. Below is an account of what it really is:

> Its real architecture is not the building but 'the design and construction of space . . . found inside, and what is inside is a representation of the

> rainforest, the mangrove swamp and the scrub forest of Asia. . . .' Obviously, this is not an Asian forest, as Asian forests do not grow in New York. Yet in this world full of trees and dense foliage punctuated by the colour of bright tropical flowers through which birds fly and other animals move, and with the rich smell of vegetation and the sounds of a busy jungle, it is almost impossible to remember that one is in fact within a building. Yet it is a man-made forest not just in the sense that trees and plant have been put in a particular location by man, but in the more profound sense that many of the trees are actually manufactured by man. The huge tree which dominates one of the areas is actually made out of steel tubing over which there is metal cloth which is itself covered by an epoxy resin textured and painted so carefully that most people would never guess that it is fake. But the vines which climb around it are real vines. Some vines however are *not*, and those which are provided for the gibbons to swing on are fibre-glass. The mist which envelops the tree tops is real mist but it is produced not by natural conditions, but by the sort of machines used in commercial citrus groves. The rockwork (except for the small pebbles) is artificial but it is a base on which real peat moss and algae grow. Although it might seem that one is in the midst of an undivided tract of forest this is not so; the rocks help form barriers to separate species which may not mix in these conditions. Here one can see animals which actually do live in Asian forests, but what one does not see is the animals living as they would do in that forest. The sound of the cooing of the forest dove is real but it was recorded in Thailand.
>
> (Mullan and Marvin, 1999, pp. 53–4)

13. Apparently, so cleverly done are some of these simulated/naturalistic habitats that not simply are lay visitors taken in by them, but also field biology students. One particular firm of zoo habitat designers, Jones and Jones, has created so realistically the gorilla exhibit in Woodland Park (Seattle) that photographs of it sent to Dian Fossey have fooled her field biology students into believing that the gorillas are wild and in their natural habitat. The National Geographic has also published, in one of its publications on Africa, a photograph of the patas monkey exhibit in that same zoo, in the mistaken belief that it is a piece of photography of wild things in the wild. (See Hancocks, 2001, p. 139.) Such incidents only show how easily humans can be visually misled about what reality is.
14. This reasoning is based, however, not on direct empirical studies of the matter as the author is not aware that any such work has been done. However, it is not implausible to assume that the animal is intelligent enough, given all its faculties and senses with which evolution has endowed it for survival, to work out that there is a discrepancy between immediate perception and reality.
15. See Worstell (2003, ch. 6).

    It is not obvious how habitat simulation can re-create the 'essence of a natural habitat'. But this point will be looked at in what follows in the remainder of this section and also in Chapter 5.
16. For some brief details about the technology behind constructing such enclosures, including biodomes, see, for instance, http://www2.ville.montreal.qc.ca/biodome/e1-intro/ef1_rens.htm [15/02/05].

17. That is, until of late, as the food industry becomes interested in the project of manufacturing tastes and flavours.
18. As Mullan and Marvin point out, it is a pity that zoo professionals, on the whole, have not taken to heart what Hediger has said about the limitations of creating naturalistic exhibits:

> The best guarantee of complete naturalness is assumed to be a faithful copy of a piece of natural scenery. This apparently logical conclusion is based on a false ecological estimate that may have serious results. Even an untouched section of the natural ground, enclosed within six sides (i.e. the closest possible imitation of a section of a biotype) is likely to be unnatural . . . Mistakes of this kind, resulting in a pseudo-natural arrangement of space, are due to ignorance of the following elementary fact: a cross-section of nature is not an equivalent part of the whole, but merely a piece which, on being completely isolated, alters its quality. In other words: nature means more than the sum of an infinite number of containers of space (cages) however natural.
>
> (Hediger in *Wild Animals in Captivity* as cited by Mullan and Marvin, 1999, p. 77)

It appears that David Hancocks, too, has missed Hediger's point: 'in the animal exhibit areas there must be one constant and inherent design philosophy: Nature is the norm' (Hancocks, 2001, 145). One should not confuse nature with a simulation of nature. If nature were truly the norm, there would be no simulated habitats; indeed, quite simply, there would be no zoos.

5 Lifestyle dislocation and relocation

1. This term does not sound elegant but has been coined by the author; its sense will soon be made clear in the chapter.
2. Of 24 exhibits of mice and rats in the UK, 17 are at London Zoo. Zoo collections, as we have already seen, are not representative of the animal kingdom; if they were, a quarter of their mammals would be bats and a third would be rodents. See http://www.goodzoos.com/Animals/small.htm [12/11/04].
3. See http://members.aol.com/cattrust/cheetah.htm [12/11/04].
4. See Worstell (2003, ch 1).
5. Although the average male qualifies to be megafauna, the female does not. (Any animal weighing more than 100 kg counts as megafauna.)
6. See Clubb and Mason (2002).
7. For further details, see http://www.nwf.org/wildlife/polarbear/;http://www.seaworld.org/infobooks/PolarBears/home.html [13/11/04].
8. For a more detailed discussion of the biological effects of living in miniaturised space under captivity, see Price (2002, ch 17).
9. See Clubb and Mason (2002, 53).
10. See Clubb and Mason (2003). The study makes similar findings with regard to lions, tigers, cheetahs – animals which roam over large areas in the wild – namely, that these are kept in analogously reduced spaces in zoo enclosures, conditions which impinge on the welfare of such zoo animals.
11. A few very rich eccentrics may choose to have no home of their own except for their permanently retained suites at the Ritz, the George V or the Hilton.

12. From this, one is not entitled to draw the conclusion that the need to roam is entirely a parasitic one, a mere side-effect of the need to look for food. In zoos, where the latter need is superseded by hotelification, it would then follow that the need to roam also becomes redundant. However, a recent study shows, for instance, that polar bears in zoos are distressed not simply because they are not allowed to hunt, but also to roam – see Clubb and Mason (2003); see also http://www.admin.ox.ac.uk/po/031001.shtml [01/10/03].

    The idea that the need to roam in the case of mammals or to fly in the case of birds is at best a parasitic one has been very influential and was first made clear by Hediger, who seemed to think that to argue otherwise is merely to be anthropomorphic. He held that it is not a physiologically necessary activity for birds of prey to fly, ignoring the basic understanding that the origin of such a bird's anatomy and physiology stems from its very ability to fly, and that the very organism has been shaped and has evolved within such a context. Hediger was in turn influenced by German philosophy in the 1930s, especially that of Martin Heidegger who gave courses on animals and animality at the University of Freiburg im Bresgau in 1929–30. Heidegger argued that freedom is impossible for animals roaming in the wild as they are consumed with trying to satisfy the essential biological needs of finding food, water, shelter, etc. On the contrary, they are only truly free in zoos as zoos by laying on 'hotel services' relieve them of the need to satisfy such basic functions; consequently, the zoo as such satisfactorily replaces the animal's home range and territory. Such an influential view did not get challenged until the later appearance of animal ethologists such as Lorenz, Tinbergen and others. (On these points above, see Baratay and Hardouin-Fugier (2002, pp. 262–3).
13. The young does so occasionally, but the adult hardly ever.
14. See http://www.worldwildlife.org/gorillas/ecology.cfm [06/01/05].
15. See Clubb and Mason (2002, ch. 4).
16. See http://www.hlla.com/reference/anafr-cheetahs.html [17/12/04].
17. See http://www.nwf.org/wildlife/polarbear/behavior.cfm [18/12/04]. http://www. seaworld.org/infobooks/PolarBears/pbdiet.html [18/12/04].
18. *See* http://www.denverzoo.org/animalsplants/mammal01.htm [10/01/05].
19. See Clubb and Mason (2002, ch. 4).
20. http://www.denverzoo.org/animalsplants/mammal01.htm [10/01/05].
21. The nutritional equivalence is only approximate – according to Clubb and Mason (2002, ch. 4), the zoo diet for Asian elephants contains more fat than the wild diet.
22. It would be too philosophically exhausting as well as unnecessary in this context to defend this thesis in great detail here and now. Suffice it to say that such an assumption is implied by the contemporary programme of (environment) enrichment which enlightened zoo management goes out of its way to emphasise as part of its philosophy. However, the concept of enrichment will be examined in the Appendix.
23. Note that independent value and instrumental value (for humans) are mutually exclusive although the exclusion could be on a continuum – less of one and more of the other; however, this does not mean that a being which has lost its independent value and acquired instrumental value is not a morally considerable being; for example, from the point of view of its ability to suffer pain.

6 Suspension of natural evolution

1. So impressed have the pharmaceutical sciences and industry been by this observation that even a new branch of pharmacology has been established.
2. Carrico (2001); see Plotkin (2000); see also Kuroda (1997) for more examples at http://www.shc.usp.ac.jp/kuroda/medicinalplants.html [11/01/05].
3. This is utilitarian ethics to which reference has already been made in Chapter 1. Although it is not the only normative system, it is, nevertheless, an exceptionally powerful one since the nineteenth century. As we shall see again in a later chapter, the philosophy of animal welfare rests on this axiom: if it is morally good, and therefore, morally obligatory to ameliorate pain in humans who are sentient, it is equally morally good and obligatory to ameliorate pain in all other sentient beings. Some exponents are even keen to extend the reach beyond domesticated and zoo animals to animals-in-the-wild – the logical conclusion to which this perspective can be pushed is a pain-free world where carnivores have been genetically modified to become herbivores, where the lion would literally lie down beside the lamb. For exposition, see Easterbrook (1996); for a critique, see Lee (1999).

   The imperative to save a life (amongst animals) with the same devotion and resources as any human life in peril may be seen in the following account: In 2001, a keeper at Bristol Zoo hand-reared a baby gorilla (Djengi). His mother died soon after his birth. (It is unclear from the account given whether the baby gorilla was found in the wild or that it was captive-born. The title of the article refers to it as 'a wild animal'; but as the word 'wild' is also used when speaking of zoo animals, its reference in this context is none too clear.) The keeper stayed with the infant in the spare bedroom at the house of the keeper of the primate section. The keeper had to feed Djengi every two to three hours in the night; he slept in the keeper's bed for the first few weeks. At about four months, the animal was transferred to a cage put in the living room. His bottles had to be sterilised till he was about 7 months old. He had to be winded until he got big enough to bring up his own wind. The gorilla, like human infants, wore nappies (as it might otherwise foul up the living room). He was bottle-fed Baby formula till 7 months old; then he was fed Complan at bedtime as well. He also had puréed fruit. The keeper sat and watched TV with him; brightly coloured things apparently caught his attention and he liked to play with the remote control. He was also clothed in jumpers. At 9 months, he left Bristol for Stuttgart Zoo, which has been running an orphanage for gorillas for 20 years where the keepers there would continue to look after him until 4 years old, an age when young gorillas in the wild would have become independent of their mothers. Djengi got the same care and attention as a human infant and lived the life of a human infant while at Bristol Zoo. See Wright (2001).

   Caesarean operations are sometimes performed on zoo animals. Jones (2000) reports that The Jersey Zoological Society and Trust (set up by Gerald Durrell) delivered through a caesarean operation of a lioness some lion cubs; the cubs were then bottle-fed.
4. At Emmen Zoo in northern Netherlands, it has recently been reported that two rhinos are being given sun-bed treatment during the winter months in custom-built 4-metre-long sun-beds. As rhinos get older, their skin gets flakier.

Exposing them, especially in the winter, to infra-red sessions of up to 20 minutes and to shorter bouts of ultraviolet rays would improve their skin–blood circulation, as well as give them vitamins. See *The Guardian* (12/02/05, p. 18).

5. In the context of natural evolution (in the wild), natural selection and natural evolution inextricably go hand in hand. Without the former, the latter would not have come about. However, the mechanism of natural selection, nevertheless, does operate in a context other than natural evolution (in the wild) – it may and does operate even in the context of artificial selection, under human-administered selection, for certain characteristics such as colour:

> man does not necessarily select those individuals with the greatest fitness (for captivity) as breeding stock for his selection programs. That is the role of natural selection. Differential mortality and reproduction, including reproductive failure, among artificially selected populations is one way that natural selection in captivity is manifested. . . . [One] focuses on the various ways that natural selection is expressed, namely, mortality and reproductive failure, and changes in these parameters over generations in captivity. . . . [N]atural selection does not cease once a population of animals is brought into captivity, but rather continues to operate regardless of whether or not artificial selection is applied.
>
> (Price, 2002, p. 51)

We should bear the above in mind in Chapter 7 which looks at the notion of artificial selection and domestication.

6. Non-anthropogenic, for the simple reason that they occurred before the evolution of *Homo sapiens sapiens*.
7. Not all animals would be subject to thirst deprivation; cheetahs, for example, do not need to drink water as they get their liquid from ingesting their prey.
8. For a more detailed exploration of synergistic causation, see Lee (1989).
9. The operative phrase here is: 'so-called counterparts in the wild'. This wording leaves it open at this stage of the discussion whether animals-in-the-wild are the true counterparts of zoo animals, a thesis which will be looked at critically in later chapters.
10. See http://members.aol.com/cattrust/cheetah.htm [11/01/05].
11. See http://www.cotf.edu/ete/modules/mgorilla/mgbiology.html [11/01/05].
12. See http://www.seaworld.org/infobooks/PolarBears/pblongevity.html [05/01/05].
13. It is obvious that in such a culture, euthanasia, even with all the practical safeguards against abuse in place, is morally problematic.
14. One such is Hancocks. He talks of a good zoo as one which gives the visitors 'lessons about life' and at the same time 'provide wild animals with safe and contented lives' (Hancocks, 2001, p. 206). *Ex hypothesi*, animals-in-the-wild can never lead safe lives; only animals in zoos can lead lives free from predation, starvation, disease, etc. It makes no sense to say that animals-in-the-wild in their natural habitats can lead contented lives as the lives they lead, with all their hazards and privations, are the only lives they can ever know and can lead. It is possible to say that some zoo animals lead more contented lives than others; those which do not mutilate themselves, do not eat

their own faeces are clearly happier than those which do. However, they engage in such activities only because they have no choice but to live in zoos.

7 Domestication and immuration

1. For the most comprehensive recent account of domestication in all its biological aspects, see Price (2002).
2. As in this context divine design is not pertinent, the discussion will confine itself in this chapter and in the rest of the book to human design only.
3. For details of these historical developments as well as the philosophy of science and technology that they embody, see Lee (2005a).
4. In the case of biotechnology, it may not be so appropriate to talk of breeding new breeds with or minus certain traits, as its techniques permit scientists to insert directly into the genome of another organism or excise from the genome of an organism a DNA sequence that is said to account for the desirable or undesirable trait in the phenotype, especially in the case of single-gene characteristics. While traditional craft-based technology and even Mendelian technology in the case of animals depends on mating, biotechnology by-passes mating altogether; furthermore, while the first two agricultural revolutions lead to the creation and generation of new breeds by mating individuals belonging to different varieties of the same species, biotechnology transcends species and, indeed, even kingdom barriers. (See Lee, 2005a, for details.)
5. See Lee (1969).
6. Note that this author deliberately uses two different words in the two different contexts – 'processes' in the case of naturally occurring events and 'procedures' in the case of technological interventions. Nature involves processes, but uses no procedures. In this usage, 'procedures' imply design and deliberate structuring which have specific outcomes in the mind of the designer.
7. Clutton-Brock (1999, pp. 144, 148) says that the use of elephants in warfare, circuses and zoos and as beasts of burden has a history of at least 3000 if not more than 4000 years.
8. According to one authority (Bökönyi, 1989), one of the constituents of domestication – morphological changes – would have taken up to 30 generations to manifest themselves, at least during the early periods of domestication. Other experts contend that evidence in modern times shows that such changes can take place within a much shorter generational span. See, for example, Bottema and his observations of greylag geese:

> It is well known that after a few generations of domestication greylag geese (*Anser anser*) become fatter and heavier, losing the power of flight ... Besides, after some time, early maturing and loss of the permanent and monogamous pair-bond occurs. Colour variations such as white, piebald, and buff appear, and feet turn orange whereas they were originally pink. The fact that greylag geese become heavier after a few generations is not a genetic change, but a result of feeding. Next to this process, a selection on weight took place, resulting in various extraordinarily heavy breeds.
>
> (1989, p. 32)

9. The adaptation on the part of an animal to its simulated habitat/environment in part involves processes which are natural, and in part procedures which zoo management deliberately imposes on the animals as part of its new existence and lifestyle. An example of the former would be the use of a stick on the part of the chimpanzee to fish for pie fillings, in this case apple sauce, from an artificial termite mound instead of using it to hook up termites from a real termite mound as its relative in the wild would do. This would be an instance of a natural adaptation on the part of the chimpanzee to its (cultural) zoo environment. An example of natural biological processes at work would be the animal becoming heavier than its wild counterpart as a result of the zoo diet, which itself is an instance of zoo policy and zoo procedures. Another instance of the latter would be the obvious fact that freedom to roam is no longer permitted or that a zoo diet is what the animals would get instead of foraging/hunting for their own food.

   Clutton-Brock has made the point more generally as follows:

   > I believe that domestication is both a cultural and a biological process and that it can only take place when tamed animals are incorporated into the social structure of the human group and become objects of ownership. The morphological changes that are produced in the animal follow after this initial integration. The biological process of domestication may be seen as a form of evolution in which a breeding group of animals has been separated from its wild conspecifics by taming. These animals constitute a founder population that is changed over successive generations by both natural and artificial selection, and is in reproductive isolation.
   >
   > (1989, pp. 7–8)

10. There are numerous competing definitions of the term 'domestication'; for a quick discussion see Bökönyi (1989) and Ducos (1989).
11. Note that the passage cited uses the term 'process'; the preferred term, for this author, would be 'procedure'.
12. The pigeon, for instance, is a 'classic case of the exploitation of a symbiotic tendency, for it is essentially a self-domesticating bird which seeks out human fields and settlements' (Issac, 1970, p. 112).

    On the subject of domestication as a symbiotic relationship, see also Budiansky (1994).
13. One way of combating this criticism is to say that the domesticated animal enjoys benefits which its wild ancestor/counterpart would not enjoy, namely that it would have a more secure food supply, be relatively better protected from certain predators and dangers. This, though, might not have been true in all instances especially during the early history of domestication. However, the important point is surely that humans would not have invested consistently over time so much effort, energy and resources to the enterprise unless they believed that domestication would benefit them greatly, irrespective of whether it would also benefit the animals in any way at all. The aim of the exercise is simply to make the animals serve their purposes and goals.
14. One example is the pigeon; see Isaac (1970, p. 112). Another motive which may not necessarily also be economic is ornamentation – some breeds of

dogs, birds and fish fall into this category. There is today another category, animals specially bred or genetically engineered as laboratory animals destined for scientific experiments.

15. Morphological changes are one kind of phenotypical change underpinned in many instances by changes in genetic patterns.
16. He writes:

> Such rapid appearance of deviating colours in many species (of ducks) cannot be explained by mutation during domestication, but it may be due to recessive factors in the wild population. The colour of wild duck species is generally dominant over other colours. The wild-colour pattern is caused by many genes responsible for the various components or for the distribution of the colours. If a mutant factor is present in a duck in heterozygous form, it will not show up in the appearance of the bird, because of the dominance of the wild-colour factors. In practice, the chances of a duck meeting a partner with the same recessive factor are limited: offspring in which combinations of the factor have occurred, e.g. white in homozygous form, will therefore be very rare. Besides there is strong selective pressure against these white mutants, as predators can see them from a great distance, For the same reason, a dominant white mutant will have little chance of surviving. On the other hand, a recessive factor, if present in heterozygous form, is not visible, cannot be eliminated by selection, and thus survives to produce a colour variant only if the owner meets a partner with the same genetic combination. The white trait, a clear negative property in the wild, can be positively valued in captivity by man. As this is a recessive trait, it will be very easy to develop a pure breeding stock of white ducks.
>
> (Bottema, 1989, p. 41)

17. An example from the distant history of domestication, concerning cattle, reinforces the point:

> In cattle, for example, a foreshortened and widened skull, decrease in the dimensions of eye and ear openings, shortness of backbone, decrease in size – in short, overall infantilism – distinguishes domestic from wild varieties. Some of the changes in the soft parts are reflected in skeletal remains. Muscular development or atrophy and changes in brain volume due to environmental modifications, such as differences in food supplied by man or the specialized physiological performance required of domestic animals, mark the skeleton and lead to the development of characteristic crests or ridges.
>
> (Isaac, 1970, p. 21)

18. However, Price (2002) discusses it at great length, although the definition quoted does not.
19. In Chapter 11, we shall be returning to this issue to assess its validity.
20. There are at least four reasons to account for why zoo animals are increasingly captive-bred and zoo-resident for their entire lives. First, as Chapter 9 will argue in detail, zoos exist primarily to exhibit exotic animals to the public; engaging in *ex situ* conservation is a parasitic activity which sits ill with the zoo's main business. Second, not all the animals exhibited in zoos are endangered. Third,

the cost of *ex situ* conservation is prohibitively high. Fourth, current thinking discourages, if not forbids, the replacement of zoo stock by capturing animals-in-the-wild. As a result, world-class zoos engage in captive breeding as a normal method of replenishment; in their bid to be conservation-minded, they hold that the default position must always be no replenishment of stock from the wild. Any deviation from this fundamental prescription will only be permitted under the most stringent conditions and would only be justified under the aegis of *ex situ* conservation. This does not mean, however, that zoos world-wide do not, as a matter of fact, buy animals captured from the wild to replenish their stock – between rhetoric and practice, there is a gulf in many cases.

21. One aspect of acculturation involves responding to the sounds of certain human commands in appropriate ways. One fairly amusing example of this phenomenon has occurred recently when Paris Zoo donated 19 of its surplus zoo-bred baboons to the zoo at Hythe in Kent. The keepers, to their amusement, discovered that these baby baboons only respond to French sounds/words such as 'dejeuner' and 'bonjour' but not to their English equivalents. As a result, the keepers had to buy a French phrase-book to communicate with these animals, who would, probably, remain 'French speaking' for the rest of their lives. (See Ward, 2005.)
22. Recall that in Chapter 6, we were careful in distinguishing between natural selection in the context of natural evolution in the wild on the one hand, and that of natural selection and artificial selection in captive environments on the other. At this stage of presenting the arguments in favour of zoos being an instance of artificial selection in captive environments, it would be appropriate to remind the reader that natural selection can and does occur in captivity.
23. This point is effectively illustrated by the following quotation from a novel by Alexander Dumas which describes the captive (future short-lived) Napoleon II who spent his childhood at the imperial Schönbrunn in Austria. One day, he managed to escape from his allotted quarters in the château to the park surrounding it. The child commented: 'I am as much captive in my room, only that instead of my prison being twenty paces in diameter, it is 3 leagues in circumference. It is no longer my window which is barred; it is that my horizon has a wall' (*The Mohicans of Paris*). (The passage is loosely translated by this author.)
24. The discussion to come and the issue it is meant to elucidate should not be confused with another different and separate issue, namely that deliberately intended artificial selection under domestication may have results which are inadvertent. For example, by consciously keeping animals in captivity, one inadvertently selects for tameness. Conscious selecting for early spawning in hatchery-raised salmon broodstock produces young, which are larger at traditional release times or can be released earlier in the spring. Conscious selecting for the Rex hair colour in rabbits has inadvertently produced certain metabolic and endocrine disturbances which increase mortality and render the animals susceptible to diseases. On these points, see Price (2002, pp. 43–44, 55).

    Furthermore, as already noted earlier, the mechanism of natural selection may not entirely be displaced in captivity. It is relevant to cite Price again:

> In general, natural selection in captivity is most intense during the first few generations following the transition from field to captive environments.

> Evolution and adaptation to the captive environment occur rapidly during this time because of the change in direction and intensity of natural selection on so many different traits and the relatively large number of correlated characteristics affected. . . . The degree of adaptation to the captive environment will increase as the frequencies of 'favorable' genes increase in response to selective pressure. An improvement in reproduction (i.e. fitness) over the initial generations in captivity can reflect the climb to a new adaptive peak as individuals become increasingly well-adapted to the captive environment over successive generations . . .
>
> (2002, p. 56)

25. The analysis seems to follow roughly the so-called desire-belief model – see Bratman (1999, pp. 6–15).
26. Absolute certainty is 100 per cent; practical or near certainty would be less than 100 per cent though more than what in lay terms may be called high probability. In real life, where diverse and complex variables are at work, the concept of absolute certainty is not appropriate; instead, one operates with the notion of practical certainty.
27. There are exceptions which are covered by what is called strict liability, under which one could be held liable for even unforeseeable consequences, provided one has done something illegal and such consequences flowed causally from that illegal act.
28. For an account of the criminal law (in England and Wales), see Smith and Hogan (1996).
29. Direct intention to kill is first-degree murder; indirect intention to kill attracts a slightly lower category of crime, manslaughter. In jurisdictions where capital punishment obtains, first-degree murder means death by electric shock, chemical means or traditional hanging, while manslaughter means either life imprisonment (with no reprieve) or a fixed sentence (subject to review). However, in jurisdictions which have abolished capital punishment, the distinction between first-degree murder and manslaughter may be more or less academic as both would attract only imprisonment.
30. If such eventualities of failure were to transpire, and if caught, the defendant would be tried for attempted murder, which would merit a verdict of manslaughter.
31. Bratman (1999, pp. 139–42) argues that so-called indirect or oblique intention does not count as intention at all; in his terminology, it would follow that indirect or oblique intention would be said to be 'unintentional'. Bratman's analysis of the concept of intention leads to counter-intuitive results; on his reasoning, the court would have to acquit the woman who posted a kerosene-lit rag through the letter-box of the house of her lover's mistress of either first-degree murder, or indeed, even of manslaughter, as the defendant would, according to Bratman, have acted unintentionally. In the tradition of Anglo-Saxon jurisprudence, at least, no defendant could be found guilty of either first-degree murder or manslaughter if the defendant had acted unintentionally.
32. See Bratman (1999, pp. 143–5).
33. The case of immuration is, therefore, analogous to that of the plane cited earlier. The causal link between direct intention/end (to put animals in captivity

in order to present them as a collection of exhibits to the public on the one hand, to plant a time bomb in the luggage hold in order to claim on the insurance policy on the other) and consequences (bringing about morphological and other biological changes on the one hand, killing the passengers and destroying the plane on the other) is in either case such a strong one that it goes beyond high probability to practical certainty. It is also analogous to the situation in environmental law where the causal link between the polluter's action and his contribution to the pollution amounts to practical certainty.

34. For instance, in ungulates under captivity, emission of adrenaline is low, which in the wild would have hampered the animals from escaping successfully from predators as such low emission reduces the muscular power required for flight. See Baratay and Hardouin-Fugier (2002, p. 273). Genetic decline is also commonly observed in zoos – see Crandall (1964, p. 377); Blomqust (1995, pp. 178–85).

    In general, it:

    > is a reasonably safe assumption that some relaxed selection will accompany the transition from field to captive environments . . . Certain behaviors important for survival in nature (e.g. food finding, predator avoidance) lose much of the adaptive significance in captivity. Hence, one would expect natural selection in captivity on such behaviors to lose its intensity. As a result, changes in the gene pool of the population are likely to occur and genetic and phenotypic variability for many traits are likely to increase. For example, behaviors of free-living prey species toward predators may be changed after relatively long periods of freedom from predators . . . Caution in accepting novel foods may decline over time in captivity. Free-living herbivores are sometimes exposed to toxic plants . . . In contrast, captive animals are generally protected from toxic food items. Hence, it seems reasonable to expect relaxed selection for food neophobia in captive animal populations . . . . In nature, locating sources of food, water and shelter, mating activities and avoiding predators can require relatively high levels of physical fitness. Physical stamina and agility are less important in captivity due to the absence of predators and provisioning of basic necessities of life by man. . . . There is also reason to suspect that natural selection for cognitive abilities may be relaxed in captive populations . . . In nature, fitness is enhanced by the ability of individuals to quickly learn the consequences of their behavior or the behavior of other animals. In captivity, humans typically provide animals with the basic necessities for survival and may buffer the negative consequences of their mistakes. Opportunities to exercise cognitive abilities are reduced when the animals' environment limits physical activity and social interactions.
    >
    > (Price, 2002, pp. 63–5)

35. An omission to do x can be a deliberate act, an act which is directly intended.
36. For the former, see Weilenmann and Isenbrugel (1992).
37. There is no need on the whole for deliberate artificial selection in the breeding of these animals because they are already perfectly well adapted for the task in hand within the environment they are expected to work – see Clutton-Brock (1999, p. 130).

38. Another instance of pertinent evidence concerns the case of hand-reared sloth bears; these 'showed significantly higher frequencies of stereotypic and self-directed behaviours such as masturbation, self-stimulation, and pacing as compared with mother-reared individuals . . .'(Kreger et al., 1998, p. 71) Recently, the newspapers reported a case at the Yangon Zoological Gardens in Burma in which a woman offered to breastfeed two Bengal tiger cubs, four times a day. These cubs had been removed from their mother who had killed the third in her litter. A veterinarian at the Zoological Society of London was reported to have made the following two comments: first, that human milk may lack sufficient fat and protein for a fast-growing tiger cub which can put on as much as 1 kg a day; second, that breastfeeding can cause changes in the animal's behaviour later in life, rendering it a social misfit. See Sample (2005). The latter point is pertinent to our concern here.

8 Biotic artefacts

1. However, this is not to deny that non-human animals make artefacts. We know, for instance, that the beaver makes dams. However, this sort of observation is not germane to the preoccupation of this book which sets out to examine how humans create zoos as an artefact and, in so doing, have also made artefacts of the animals kept and controlled within zoos as exhibits.
2. A more technical and formal definition may be given as follows:

> By an 'artifact' I mean here an object which has been intentionally made or produced for a certain purpose. According to this characterisation, an artifact necessarily has a maker or an author, or several authors, who are responsible for its existence. . . . Artifacts are products of *intentional making*. Human activities produce innumerable new objects which are entirely unintentional (or unintended); such objects and materials are not artifacts in the strict sense of the word. When a person intends to make an object, the content of the intention is not the object itself, but rather some description of an object; the agent intends to make an object of a certain kind or type. Thus what I want to suggest is that artifacts in the strict sense can be distinguished from other products of human activity in the same way as acts are distinguished from other movements of the body; a movement is an action only if it is intentional under some description . . . , and I take an object to be an artifact in the strict sense of the word only if it is intentionally produced by an agent under some description of the object. The intention 'ties' to the object a number of concepts or predicates which define its intended properties. These properties constitute the *intended character* of the object. I shall denote the intended character of an object *o* by '*IC*(*o*)'.

Thus an object *o* is a proper artifact only if it satisfies the following *Dependence Condition*:

> . . . The existence and some of the properties of *o* depend on an agent's (or author's) intention to make an object of kind *IC*(*o*).
>
> (Hilpinen, 1995, pp. 138–9)

Note, however, that Hilpinen's definition of 'artefact' is much wider than that used by this book which stipulates that the human intentionality be embodied in a material medium. On this account, unlike Hilpinen's, belief systems and concepts are not artefacts. For instance, the concept *per se* of the division of labour is not an artefact; however, that concept could be applied in practice to design/create, say, the Ford assembly production line which, is, of course, itself an artefact. (For a more thorough philosophical examination of the concept of artefact, see Lee (2005a, ch. 1.)

3. For details of this point, see Lee (2000).
4. Aristotle, in talking about the four causes, has invoked abiotic/exbiotic artefacts to illustrate them; this seems to have influenced unduly how theorists/philosophers have looked at the matter ever since.
5. This view in environmental philosophy is referred to as anthropocentrism, namely that only humans are morally considerable (or intrinsically valuable), and that all other natural things and non-human beings have only instrumental value for humans. We have seen in an earlier chapter that another term for anthropocentrism is human chauvinism.
6. However, no volition should be read into this locution in the case of plants or the lower animals.
7. In this context, *telos* or *tele* (in the plural) is used to refer to the developmental programme, which inheres in every individual organism as a naturally occurring being. For example, an acorn, in accordance with its *telos*, would become an oak sapling, which would grow eventually to be a mature oak tree, producing in turn its own acorns.
8. For degrees of artefacticity, see Lee (1999).
9. However, the term 'species' is not exclusively confined to discourse about biological matters. Historically, it has also been used (although today it appears to have an old-fashioned ring about it) to naturally occurring abiotic matter, such as different natural kinds of minerals. See Wilkerson (1995); see also Laporte (2004).
10. The time-scale is crucial. Those who advocate *ex situ* conservation as a means of saving certain species from extinction are aware of this; hence they talk of a time-span of a 100 years, at most of 200 years, if the captive-bred animals (even in the presence of precautions taken to fend off some of most obvious consequences of immuration) are to remain members of the same species as those individuals which live in the wild.
11. More formally it may be defined as follows: 'a group of actually or potentially interbreeding natural populations that is genetically isolated from other such groups as a result of physiological or behavioural barriers' (Clutton-Brock, 1999, pp. 41–2). Indeed, certain populations of bats may occupy the same space but nevertheless constitute different species, as they do not interbreed because their respective mating calls operate on slightly different frequencies. 'Genetic isolation' is itself a complex notion and may cover numerous aspects of which the bats cited exemplify but one. Another refers to the fact that even if two individuals succeed in mating, it fails to lead to reproduction, and that even should there be successful reproduction, hybrids are born which are sterile, and therefore, in turn, cannot reproduce themselves. For the purpose of this book, the most important aspect is that zoo-born and zoo-bred animals and their counterparts in the wild remain 'genetically isolated'

because they do not and cannot meet and mate, as they occupy different locations/spaces and habitats; they can only meet and mate when humans permit them to do so. (For details, see Lee (1997b).)

12. This author agrees with the view of Mullan and Marvin (1999, p. 12) that zoo animals form a new and distinct species; however, these two authors argue simply on the grounds that zoo animals appear neither to be wild nor domesticated animals. This book argues that they are domesticated, though not in the classical understanding of the term, and that therefore they are immurated animals.

    In the literature about classical domestication, variations in the taxonomic designation of the domesticated and the wild are found; for instance, wild and domestic forms of the pig are often given as *Sus scrofa*, on the grounds that although the wild boar and domestic pig are typically found in different environments, their phenotypic differences and their habitat choices are not as dramatically different as between wolves and dogs and that, furthermore, domestic pigs can successfully become feral if given the chance. However, other writers list the domestic pig as *Sus domesticus* – see Clutton-Brock (1999). In general, different taxonomic names commonly mark the distinction between wild and domestic forms. For instance, the domestic chicken is either *Gallus domesticus* or *Gallus gallus domesticus* whereas its wild ancestor, the jungle fowl is called *Gallus gallus*. The controversy concerns the issue whether the domesticated represents a separate species or subspecies. Those arguing for separate status are impressed by the fact that wild and domestic forms are morphologically, behaviourally and/or ecologically distinct. Those arguing against rely on the theoretical possibility of their interbreeding, and therefore on their respective genetic distinctiveness as a subspecies. For further details on this debate and a solution to the problem raised, see Price (2002, pp. 3–4).

9 Justifications deemed serious

1. Vienna was the first to get a (modern) zoo in 1752, followed by Paris in 1793 in the wake of the French Revolution, and then London in 1826.
2. On these points, see Baratay and Hardouin-Fugier (2002).
3. The Department for Environment, Food and Rural Affairs (Defra), UK, has issued a document in connection with the European Union Zoos Directive, 1999. That document contains 7 examples of research projects which zoos could undertake; with the possible exception of one, the rest are concerned solely with issues and problems arising from zoo management and husbandry. See http://www.defra.gov.uk/wildlife-countryside/gwd/zoosforum/handbook/2. pdf, 30–31. [03/02/05].
4. Mayr has written:

> Every organism, whether an individual or a species, is time-bound and space-bound. There is hardly any structure or function in an organism that can be fully understood unless it is studied against this historical background. To find the causes for the existing characteristics, and particularly adaptations, of organisms is the main preoccupation of the evolutionary

> biologist. He is impressed by the enormous diversity as well as the pathway by which it has been achieved. He studies the forces that bring about changes in faunas and floras and the steps by which have evolved the miraculous adaptations characteristic of every aspect of the organic world. In evolutionary biology almost all phenomena and processes are explained through inferences based on comparative studies. These in turn, are made possible by very careful and detailed descriptive studies. The evolutionary biologist is interested in the why question.
>
> (Mayr, 1982, p. 71)

5. See Meek (2001).
6. The point made is therefore different to the one made below:

> **Research**: The options available for off-exhibit research animals can actually be more diverse and cost-effective because the emphasis can be purely on functional rather than on aesthetic considerations . . . Public perceptions are not as critical when animals are designated for research purposes and the research facility is not on public view. Environmental enrichment is still important, however, because atypical behaviour and associated physiological stress can add unwanted variation to the experimental design, thereby confounding the results and jeopardizing the validity of the study . . .
>
> (Kreger et al., 1998, pp. 64–5)

While recognising that off-exhibit space for research animals is much smaller and barer than exhibit space and that enrichment is still appropriate, nevertheless these authors have failed to see that the off-exhibit space designated for research animals (which is already smaller than exhibit space) may itself be a cause in bringing about physiological and behavioural changes, and indeed may even lead to brain damage induced by confinement within a very limited space. In other words, enrichment may not be always or entirely successful in counteracting the effects of the variable of severely confined space. More systematic research should be conducted to clarify matters; until that happens, scepticism regarding the validity of results conducted on research animals within confined space, whether in zoos or in laboratories, is justified.

Some zoo researchers and professionals have acknowledged the limitations of enrichment for the psychological well-being of captive animals, such as the macaque monkeys which are the subject of one of these studies:

> Our own studies added substantially to the emerging evidence that modest variations in cage size have little measurable effect on the psychological well-being of monkeys . . . Neither urinary cortisol, appetite suppression, nor abnormal behaviour varied significantly as a function of cage size . . . I want to dispel the illusions that increasing cage size, within the range likely to be possible in a research lab or behind-the-scenes zoo setting, will provide meaningful enrichment to macaques . . . Novelty can stimulate exploratory behaviour but can also elicit fear and disturbance.
>
> (Crockett, 1998, pp. 133–5)

Another set of zoo writers have also admitted the same point made above:

> increasing cage size fails to result in any measurable changes in behaviour . . ., even if that increase is more than 600 times the standard size. The data obtained from these empirical assessments suggest that increasing cage size as a means by which to enrich and enhance an animal habitat may not be worth the cost, at least under conditions in which the size of the cage is the only aspect that is altered.
>
> (Morgan et al., 1998, 160)

7. This seems to be the fate which has overtaken Glasgow Zoo which closed down at the end of September 2003. Admittedly, financial debt was the obvious cause; however, behind that truth is also that the zoo, already in a precarious financial situation, would not be able to meet the requisite demand that it could demonstrate continuous participation in, and contribution to, the goal of conservation.
8. According to the document, all zoos must implement the following measures:

   - participating in research from which conservation benefits accrue to the species, and/or training in relevant conservation skills, and/or the exchange of information relating to species conservation and/or where appropriate, captive breeding, repopulation or reintroduction of species into the wild,
   - promoting public education and awareness in relation to the conservation of biodiversity, particularly by providing information about the species exhibited and their natural habitats.

9. *In situ* conservation may be defined as:

   > The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings . . .

   Ex situ conservation may be defined as:

   > The conservation of components of biological diversity outside their natural habitat.

   These definitions are taken from the Convention of Biological Diversity and as cited in Defra's document on the *EU Zoos Directive* (1999, p. 2). http://www.defra.gov.uk/wildlife-countryside/gwd/zoosforum/handbook/2.pdf [03/02/05].

   Another similar definition of *ex situ* conservation may be found in *WZCS* (1999). It refers to:

   > the maintenance of wild animals in stable populations outside their original biotrope. Being out of their original habitat means that the animals were separated from the other components of their natural community, and are kept in zoos, other types of scientific institutions, breeding centres, or in semi reserves.
   >
   > (ch. 6.1)

10. Neither do zoos contribute anything significant financially to *in situ* conservation programmes in general, although in 1999 zoos supported more than 650 such projects – see Olney and Fisken (2003).
11. One matter which may be worth pointing out to readers is that the two key bodies (cited in this book) exhorting zoos to embrace conservation as a central justification for their existence differ in their view as to what constitutes breeding stock under *ex situ* conservation. While the *WZCS* stresses that the animals must be captive-born and -bred unless there are exceptional circumstances to justify the capture of an animal from the wild, the Defra gloss on the *EU Zoos Directive*, appears to put the emphasis somewhat differently. It says:

> Stock should only be taken from the wild, regardless of whether it is to be part of a managed programme, if there is evidence to show that collection will not have a detrimental effect on the population, species as a whole or its habitat . . . Collection from the wild is not always detrimental.
>
> (1999, p. 13)

12. A recent telling critique from a zoo professional is that of Hancocks. He says that fewer than five species have been saved from extinction – see (2001, p. xvii). Furthermore, he points out that the 'most optimistic projections state that if all the world's professionally operated zoos, in concert and under perfect conditions, devoted a full half of their facilities to breeding endangered animals they could perhaps manage about eight hundred of them in viable breeding populations' (ibid., p. 152)'. However, of vertebrate species alone, there are about 46,000 in existence.
13. See Article 2 at http://europa.eu.int/eur-lex/pri/en/oj/dat/1999/l_094/l_09419990409en00240026.pdf [03/02/05].
14. As cited by Clubb and Mason (2002, p. 11).
15. Note that captive breeding with the self-contained aim of replenishing zoo stocks is not subject to such a restriction.
16. Of course, domesticants like cats and dogs, the products of what this book has called classical domestication, are another kind of ontological foil to naturally occurring wild animals.
17. As we have seen, which animals get to reproduce is guided by the explicit goal of maintaining genetic variability.
18. There is one outstanding instance of a (private) zoo which runs an *ex situ* conservation programme based on lines which are the exact opposite of what is endorsed by the scientific consensus. This is John Aspinall's Howlett's Animal Park which claims that its success in captive breeding depends exactly on 'being friends' with the animals, encouraging keepers to have intimate physical contact with the animals, romping with them, which makes the animals happy and contented. Now this may be so, as far as the reproductive rate of captive breeding is concerned and as far as animal welfare itself is concerned. However, the point missed by such a perspective is precisely that such intimate contact and relationships with humans render the animals tame – they are happy, contented tame/immurated animals, not wild animals. See http://www.guardian.co.uk/print/0percent2C3858percent2C3962804-103390percent2C00.html (13 February 2000); http://www.totallywild.net/howletts.php?page=howletts. [23/03/05].

19. Just to cite one example regarding the Californian condor (*Gymnogyps californianus*) captive breeding programme initiated by the US Fish and Wildlife Service in 1984, but run by the San Diego Wild Animal Park and Los Angeles Zoo in conjunction with other interested bodies. The 27 last remaining condors (of a reproductive age) were captured to form the core of the breeding programme; from these, the zoos successfully bred more than 200. By 2001, half of them have been returned to the wild and some of these have bred in turn. As mentioned earlier, the chicks were reared by scientists wearing condor-like puppets etc. The first attempt at releasing two of the birds in 1992 was not a success; one of them died when it swallowed antifreeze and the other had to be recaptured when it kept landing on power lines and pylons. The second attempt later that same year was not successful either; three died when they collided with power lines and the other three also had to be recaptured because of their 'fondness' of landing on power lines. The next year, more were released but this time, far from the pylons and electricity lines; however, there was no improvement in the success rate. The scientists finally drew a lesson from these failures – they began to teach their birds to avoid pylons and such dangerous things, by setting up two electricity poles in the enclosures which gave the birds a mild electric shock whenever they approached them. This tactic seemed to have worked as none of the birds in the next batch released died from electrocution or collision with electric cables. But that alone did not ensure long-term survival, as these birds lacked the appropriate knowledge and the relevant skills of how really to survive in the wild, a deprivation brought on by the fact that they were raised by humans disguised as condors within a zoo environment. Eventually, the scientists resorted to giving them in their enclosure what may be called a mentor, an older bird which had been captured from the wild and had known existence in the wild. When these pupils were released, it was found that they behaved more like adult condors. In May 2002, the scientists went even further and released an older bird, which had once lived in the wild and was now well past the age of reproduction, together with the captive-bred juveniles, hoping that she would remember the roosting sites and the watering holes she must have visited 14 years ago. The experiment was acclaimed a success, although problems still remained. The captive-bred birds failed to avoid prey that has been killed with shot which contains lead. Finally in the spring of 2002, the first wild Californian condor was born. By 2020, the scientists expect to achieve the goal of removing the condor from the endangered species list when they will have established two stable wild populations of 150 birds each, as well as maintaining a captive population of 150. See Kaplan (2002).

    It is also interesting to note that the reintroduction would not have been possible without the introduction of an exotic related species, namely the Andean condor. It is true that when the programme of reintroducing the Californian condor had stabilised by 1991, the exotics were recaptured and returned to their South American habitat. Nevertheless, this shows that the scientists and related professionals were prepared to import an exotic species in order to learn how condors behave in the wild as well as to enlist these exotics to help the captive-bred juvenile native condors to learn condor culture. (For details, see http://species.fws.gov/species_accounts/bio_cond.html [09/02/05].) This demonstrates the point, which will be discussed in greater

detail a little later, that not all conservation scientists fully grasp the true significance of what Chapter 1 of this book has called the zoological conception of an animal, namely that a species in the wild and its individual members, in all aspects of their behaviour and their culture, are the product not only of the processes of natural evolution and the mechanism of natural selection, but also of the complex interrelations among themselves as well as between them and their habitat.

20. For an account of the problems facing captive-born and reared animals for release in nature, see Price (2002), ch. 19, but especially his conclusions on p. 202.
21. For the former, see, for example, http://www.animalinfo.org/species/artiperi/elapdavi.htm [09/02/05]; and for the latter, see Hancocks (2001). As a compromise, one could suggest that the animal became extinct in the wild roughly 1500 years ago.
22. On all these changes, see Price (2002); on genetic changes see also Crandall (1964, 377) and Blomquist (1995, 178–85). Regarding phenotypical changes, Price cites one longitudinal study of wild Norway rats (*R. norvegicus*) over the first 25 generations in captivity. The study reports increase in 'body weight, percentage of mated pairs that produced offspring, number of litters born and length of the reproductive lifespan. The investigators also reported that the tendency to escape and the resistance to handling declined over generations . . .' (Price, 2002, p. 16).
23. See Baratay and Hardouin-Fugier (2002, pp. 273–4).
24. Note that in the case of the Père David deer, no one has a clue not only about its original habitat in the wild but also what the genetic variability in the original wild population would be.
25. An example when conservation scientists/managers forget the equally important precondition of conserving genetic variability concerns the Española tortoise in the Galapagos Islands. From 14 individuals in 1965, the population has increased to over 800 today. Indeed the species would have become extinct by now without the acclaimed success of this captive breeding programme for reintroduction to the wild. However, according to a genetic study conducted by the Free University of Brussels (Belgium), the population lacks genetic diversity. In 1965, the two remaining males and 12 females were transferred to the Charles Darwin Research Station on Santa Cruz Island and captive breeding began with reintroduction in the wild in 1975. However from a study of 134 of this population, the scientist has found that its genetic diversity is equivalent to roughly 11 unrelated individuals when it should have been 300. Nearly 80 of the individuals sampled turn out to have been sired by a single male from San Diego Zoo, nicknamed Super Macho. If this finding is correct, then the revived population may, nevertheless, face extinction in the long run in view of the problems and difficulties facing a population with such a small number of founding members. See Anderson (2004). For a brief summary of why genetic variability is important, see *WZCS* (1999, ch. 6.2).
26. For the term 'lifeline', see Steven Rose, especially ch. 6. It may be appropriate to cite the last paragraph from that chapter:

> Lifelines . . . are not embedded in genes: their existence implies homeodynamics. Their four dimensions [of space and time] are autopoietically

> constructed through the interplay of physical forces, the intrinsic chemistry of lipids and proteins, the self-organizing and stabilizing properties of complex metabolic webs, and the specificity of genes which permit the plasticity of ontogeny. The organism is both the weaver and the pattern it weaves, the choreographer and the dance that is danced. That is the fundamental message of this chapter, and therefore in many ways of this entire book. And it provides the framework within which I turn now to consider the mechanisms of evolution.
>
> (1997, p. 171)

27. In July 2004, the Natural Science Museum (London) announced what is dubbed its Frozen Ark Project. The aim of the museum, the Zoological Society of London and the University of Nottingham together with other like-minded institutions throughout the world is to freeze DNA and tissue samples of animals facing extinction, so that scientists would be able to continue to study them from the evolutionary point of view, as well as in the hope that, very soon, advanced cloning techniques would enable the re-creation of extinct animals, using surrogates. The Project will begin with animals from zoos, captive breeding and other research programmes. See Sample (2004) and *New Scientist* (31 July 2004, p. 5).
28. The Indian scientists claim that they have had some breakthroughs recently in overcoming the problems associated with the lack of genetic variability inherent in cloning from cells of a small number of animals.
29. See Ramesh (2004) for the details cited of the Indian cloning project of the Asiatic lion and cheetah.
30. One would not like to carp, but it does seem surprising to read in the two quotations just cited from Hancocks (2001) that its author appears to think that zoos display their animals in natural settings rather than simulated naturalistic settings, that is to say that such exhibition enclosures are constructed entirely with the help of technology, as shown earlier in Chapters 4 and 5.
31. See *WZCS* (1999, ch. 31).
32. According to Kreger et al.:

> If an animal or group of animals is intended to serve an educational role, then . . . a premium is placed on the naturalistic appearance of both the exhibit and the animals it contains.
>
> (1998, p. 62)

According to Jones and Jones in their 1985 Kansas City Master Plan, their message of structured zoo conservation-education programme is as follows:

> A new approach to zoo design begins with presentation of animals in such a way that their right to exist is self-evident. The educational message accompanying this presentation should be clear and persuasive. Whole habitats should be exhibited, with rock and soil substrates and vegetation supporting communities of species typical of the environment and logically associated. Visitors should feel they are passing through a natural environment, with a feeling of intense involvement. The point should be

> made that animals live in habitats, and it is the destruction of those habitats that is the principal cause of wildlife extinction today.
>
> (As cited by Mullan and Marvin, 1999, p. 60)

33. For instance, according to figures of the *International Zoo Yearbook*, in North America, over 100 million people – that is, just under 50 per cent of the population – visit zoos on an annual basis; the figures for Europe and Japan are similarly high. See *WZCS* (1999, ch. 3.2).
34. The figures are cited in Mullan and Marvin (1999, p. 133).
35. See also ibid., p. 136.
36. This is, however, not to deny that seeing a living exotic animal does have unique appeal (as we shall see in the next chapter); it is just not obvious that it has that special transformative power to educate the public which zoo advocates claim it does.
37. For instance, David Hancocks has written:

> careful application of landscape-immersion philosophy, with attention to concealed barriers and authentically replicated forms of the natural landscape and use of borrowed vistas and studied sight lines, can all combine to create a memorably evocative experience in which zoo visitors associate wild animals with appropriate wild habitats. It achieves two important goals. Zoo visitors, even if they don't read the interpretive graphics, can learn by associative intuition that certain animals and certain habitats are inextricable. And they can by similar association gain more respect for wildlife.
>
> (2001, pp. 147–8)

38. The resemblance is not absolute; immurated animals over the years, as we have already mentioned, would display morphological/anatomical and other biological features which are somewhat different from their counterparts in the wild. These differences, however, would not be readily detectable to the passing eye of the ordinary visitor at a distance.
39. See Martin Mere: http://mm.eyelook.co.uk/edu/edu.html [16/02/05].
40. There is another method which is used on the pelicans in St James's Park (London) precisely because the Royal Family found evidence of mutilation, caused by pinioning, stressful. This involves removing one or two strips of the extensor tendons on the leading edge of the wing. This means that the bird would not be able to thrust downwards into the wind to fly. However, this method of rendering it captive but without ostensible mutilation is not foolproof; occasionally in a strong gale, it could be lifted off. See Jones (2002, p. 139).
41. In the case of tamed birds, morphological reductionism does not work so well, as already pointed out the visitors could see readily for themselves that the birds do not fly, and therefore do not resemble in one essential way birds in the wild; they might also observe that one of their wings had been mutilated.
42. One could also get to this conclusion, that a certain dissonance is inherent in the zoo experience itself, even without the benefit of having visited zoos. The experiment one is engaged in is, after all, only a thought experiment, and that is all which is needed here.

43. See Mellen et al. (1998, p. 198).
44. See Baer (1998, p. 293).
45. See Clubb and Mason (2002, ch. 5).
46. One could perhaps say in their defence that they do not distort reality quite as blatantly as Carl Hagenbeck's attempts to create theatrical spectacles of his exhibits at Stellingen at the beginning of the nineteenth century. Hagenbeck exhibited them in the open without cages; he aimed to create the illusion that there was no separation between the human visitors and the captive animals, and indeed between the various species of animals on display. He did not hesitate to put predator next to prey; he created invisible (that is, to the human visitors) barriers which the animals could not cross between the groups of animals. Today's arrangements may spring from different motives and the effects aimed at may not be exactly identical to Hagenbeck's, but in spirit they are akin to his. That is to say that both types of arrangements do not portray animals-in-the-wild, as they manifestly claim to do, but to present immurated animals as exhibits.
47. Note that this author differs from Hancocks in the vital matter of the ontological status of zoo animals, namely, that they are not wild but artefactual in character; on the other hand, Hancocks seems to imply that they are wild, but that, unfortunately, zoos have not succeeded or made the right efforts in presenting them in their full wildness.
48. Such children would be those very same children who see their families buy milk in cartons from supermarkets and, as a result, infer that milk comes from supermarket shelves, and that domesticated animals called cows have nothing to do with the provenance of milk.
49. See Hancocks (2001, p. 249).
50. See Andersen (2003, p. 79).
51. In order to give visitors a taste of carnivores hunting their prey, the Panaewa Zoo in Hawaii has installed clay figures in the tiger enclosure to be operated by a computer but which the public can manipulate, whenever they like, in order to see the tiger 'hunt' a rabbit or squirrel (in clay) which could then be 'saved' by a computer – see Baratay and Hargouin-Fugier (2002, p. 268). Some zoos in non-Western parts of the world are apparently 'bolder' in their policy of what may be fed to their animals in public. This author has been told by a recent visitor to Harbin Zoo that visitors could choose a cow, pay for it, and get the zoo staff to feed it to the tiger for all to behold. Now, this supposedly 'barbaric' practice would at least have the decided merit of teaching the public by allowing them to see what carnivores really eat and how they eat in the wild; most assuredly, they would not leave the zoo thinking that wild tigers in the wild dine off zoo pellets! (This author has no means of checking whether by now such a practice has ceased in Harbin Zoo.)

10 Justifications deemed frivolous

1. Of course, adherents of the philosophy of animal rights would have objections to zoos, but zoo professionals, in the main, are not known to be supporters of animal rights as far as this author knows.
2. These numbers are cited by *WZCS* (1999, ch. 3.2).

3. Ironically, those who may stand a chance of success in bringing a case under the Trade Descriptions Act would be those visitors who can genuinely claim that zoos do not trade fairly only in the light of their zoo experience – that is to say when they fully grasp the dissonance between the exotic exhibits under captivity on the one hand, and wild animals and their behaviour in the wild on the other, and they have been lured by zoos into seeing animals billed as wild when in reality these are not wild at all.
4. Shepherdson writes:

> An animal in the wild basically does only a few things. It hunts, eats, sleeps, often plays and breeds. But when they don't have to hunt for food or engage in normal activities like playing or exploring, they can become bored, even morose. http://www.zooregon.org/ConservationResearch/environm.htm [16/02/05].

5. See Poole (1998, p. 84).
6. Singapore Zoo advertises this experience on the web: http://www.sightseeing-tours.net/web/_li-n73p-2.html [22/02/05]. Tickets start from £13 (Sterling) per person. The highlight of the experience is described as follows: 'Witness the orang utan descend from a naturalistic backdrop filled with vines and branches, followed by a once-in-a-lifetime opportunity for interaction and photography with these intelligent and iconic symbols of the disappearance of the tropical rainforests.' This is followed (without irony) by the line: 'With a commentary highlighting the plight of this magnificent creature, the Zoo hopes to inspire in its guests a respect and deep appreciation of nature.'
7. Possibilities include London Zoo, Singapore Zoo and the Smithsonian National Zoological Park. For the former, see http://www.londonzoo.co.uk/weddings/wedding.html [22/02/05]. Its brochure (received September 2004) says: 'Hold your event at London Zoo and you are helping to support our vital conservation work throughout the world.' Animal Houses: Bear Mountain on the Mappin Pavillion (holds 150 people); Happy Families (200); Lion Terraces (200); Reptile House (350) B.U.G.S! (350); Komodo Dragons (100). 'Unique Features: View some of the world's rarest animals after the zoo closes, in one of these six unique venues. Perfect for canapé receptions, pre-dinner drinks, parties and barbecues.' For Singapore Zoo, see: http://www.singaporebrides.com/venue/wrs/ [22/02/05]. For the Smithsonian Zoological Park, see http://nationalzoo.si.edu/ActivitiesAndEvents/Celebrations/birthday-parties.cfm [25/02/05]. This zoo as well as the San Diego Zoo, amongst others, offer sleepovers for children and adults, marketed as Snore and Roar. http://www. sandiegozoo.org/calendar/cal_sleepovers.html [22/02/05].
8. Shamu is just one of three names – the other two being Kandu and Nandu – dreamt up by the marketing boys to refer indiscriminately to any one of the three performing killer whales in the zoo's entourage, although it is true that Shamu is more often used than the other two. Their real, behind-the-stage, off-duty names are known only to the Sea World staff – see Mullan and Marvin (1999, 23).

11 Philosophy and policy

1. Their philosophical preoccupation focuses on captivity denying the animals the right to be free. Although it is true that not to be free to roam is part of the denial to be wild, nevertheless the source of their concern lies primarily in political philosophy rather than in ontology.
2. Professionally endorsed zoos, at least according to their mission statements, have renounced the policy of capturing wild animals to replenish their stock; instead, they do so through captive breeding.
3. As for the goal of *ex situ* conservation, recall that the last chapter has argued that it is an activity which sits ill with the defining characteristic of a zoo as a collection of animal exhibits open to the public. Therefore, even if such an activity were to be deemed to be desirable, it should be conducted elsewhere in a different space. However, this book has said enough on the subject for the conclusion to be drawn that *ex situ* conservation, because of the ontological risks and the heavy financial resources involved, has little or no merit and that such resources should be channelled towards *in situ* conservation instead.
4. This, however, as an earlier remark has already made clear, should not be interpreted to mean that zoos should not support *in situ* conservation financially or by way of resources which are considered scientifically as well as ontologically relevant to the projects of serving species and their habitats in the wild.
5. It is true that, at the moment, the success rate of such techniques is not very high. However, scientists working in these technologies hope to improve it and are confident that improvement would come in the light of further experimentation and research.
6. The two types of biodiversity – natural and artefactual – have different values because of the difference in their ontological status. See Lee (1999) and Lee (2004).

Appendix: Environmental enrichment or enrichment

1. Shepherdson (2001) gives two other justifications, namely, enriched environments are more interesting to zoo visitors; they help conservation by improving reproductive rates, psychological behaviours when the captive-born grow up to become adults, and survival rates upon introduction to the wild in the case of animals taking part in *ex situ* conservation programmes.
2. However, one should be wary of the claim that boredom is at the bottom of all stereotypies. There may be a genetic 'predisposition for the development of stereotypies' in some cases – see Price (2002, p. 220); furthermore, '[t]here is increasing evidence that many stereotyped behaviours reflect feeding . . . problems . . . that premature weaning and low weaning weight result in the development of relatively high levels of stereotyped wire-gnawing on the lids of their cages' in the case of laboratory mice (*m. musculus*).' In other words, '[s]tress early in life could predispose animals to stereotypy by affecting the persistence of behaviours exhibited at that time' (Price, 2002, pp. 218–19).
3. Physical distress may not manifest itself as stereotypic behaviour but could be readily ascertained by, say, abnormal condition of the feet in the case of

animals with soft pads when they are made to stand on concrete most of the time.

We are, in this discussion, however, concerned primarily with the amelioration of psychological distress.

4. The third, however, namely to aid conservation, only applies to a tiny portion of zoo animals. Furthermore, that small proportion, which does take part in *ex situ* conservation, would have to be protected from such enrichment schemes, as Chapters 7 and 9 have shown.

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