

Animals on Display: Principles for interpreting captive wildlife

Barbara Woods

Abstract

The goals of modern zoos include education, research, conservation and preservation. As tourism ventures, they also depend upon visitor enjoyment. To achieve these goals with people at leisure requires careful planning and interpretation. The exotic, fascinating and beautiful animals on display often trigger the curiosity, appreciation and respect that zoo staff are seeking to instill in visitors. However, it is important to assist visitors to interpret what they experience through accessible and interesting information. In addition, it is vital to avoid giving visitors incorrect or misleading information through presenting wildlife in a manner that is alien to their natural state. This paper reviews research to develop a set of principles for interpreting and displaying animals in captive environments such as zoos, sanctuaries and wildlife parks.

The effect of the lion's roar was remarkable. It was an overcast day at suburban Taronga Zoo in Sydney, and a steady stream of visitors wandered through the "Africa" section of the zoo. The lions were asleep on their ledges, with only a tail and rump in view. The zebras were standing around swishing flies with tails inappropriate for the task. The weather was steamy, children were complaining. Suddenly a roar echoes around the fake rock ledges. The male lion stands in all his magnificence on the ledge, roar after roar echoing around the enclosures, tingling down the spines of visitors. The zebras raise their heads and prick their ears, the whites of their eyes registering mild alarm. The sound of their natural predator did little more than raise their interest. Yet the effect on the visitors was dramatic and immediate. They ran from far and wide to view the lions, crowding at the window to the enclosure. Voices were raised in excitement, people enjoying the sensation of mild fear. Even after the lion flopped back down to doze, crowds remained at the window. Children were talking about the lions. People asking "did you hear him roar? Did you see how big he was?" Many saying the sound was scary, spooky, or spine tingling. People reading the information signs. Excitement. Interest. Maybe even appreciation and respect.

This event reinforces the view of Robinson (1994, p. 41) that the biological and conservation messages of zoos are "best reinforced by beautiful, exciting and mind expanding activity from our animals". Arguably, the primary attraction of zoos are the animals themselves. Yet the methods used to present these animals to visitors can have a critical impact on capturing the interest of visitors, encouraging learning and increasing the information and attitudinal messages

Barbara Woods is a Research Officer for the CRC for Tropical Rainforest Ecology and Management at James Cook University, Australia.

they take home. Although the animals can easily generate interest and wonder through such impromptu performances, interpretation and zoo design should stimulate interest even if, in this case, the lion remained sleeping on the ledge.

Zoos and wildlife sanctuaries have changed radically in the past one hundred years. In the late 1800's zoos were places to see wild, exotic animals primarily for entertainment. Wide formal walkways displayed cages of animals, and the main emphasis was species identification and classification (Wineman & Choi, 1991). The aim was for 'scientific presentation' in uniform, systematic rows. A typical view was that "Birds look best, on the whole, in uniform rows, assorted according to size as far as classification allows" (Hancock in Wonders, 1989, p. 135).

The greatest revolution in zoo design was led by the German Carl Hagenbeck, who introduced the park concept. His first park opened outside Hamburg in 1900, with landscaping, moats and trees to give the illusion of freedom (Shackley, 1996). Zoos have been progressively moving toward presenting animals in natural surroundings and in modern zoos, visitors no longer expect to see animals confined in small, barred cages. This progression has been paralleled by changes in visitor attitudes. Animal rights have become regarded as an important issue. The keeping of animals in captivity is regarded by many as ethically indefensible, even for educational purposes (Shackley, 1996). Visitors to zoos are "better informed, better travelled and far more environmentally aware than their 1950's counterparts" (Shackley, 1996, p. 105). Furthermore, the primary concerns of most visitors are that captivity is comfortable, and the animals appear healthy and happy (Wolf & Tymitz, 1981).

Where once the philosophy of zoos

was to exhibit as many species as possible, regardless of cramped conditions, modern zoo management takes a different view. Zoos are still places of recreation and enjoyment, but changes in public expectations and scientific views have added education, research, and the conservation and preservation of wildlife to their roles (Dengate, 1993). How can zoos achieve these goals? This paper reviews research on methods of presenting wildlife to visitors, to achieve the goals of enjoyment, education and encouraging pro-conservation attitudes. Although the word 'zoo' will be used, the principles are applicable to a wide range of situations where captive animals are displayed to visitors.

Interpretation in zoos

When contemplating interpretation in zoos, it is difficult to separate specific techniques such as signs from the whole experience (Blakely, 1981). Interpretation involves the whole animal and its exhibit, as well as the relevant graphics, signs, booklets, keeper talks and guides. The entire zoo experience and atmosphere provide both formal and informal, conscious and subconscious learning opportunities. However, evaluating learning and attitude change is difficult. Little is known about how effective different methods are in educating visitors about the animals and conservation, and creating favourable perceptions of zoos (Ford, 1995). Major difficulties include the complexity of attitude change and learning, and the huge variety in exhibit styles and features which mean that research results are often highly specific. However, despite these difficulties it is possible to provide useful principles for interpretation in zoos.

Accurately representing nature

Being natural

Zoos are representational

constructs. Many authors (e.g., Bacon & Hallett, 1981; Wineman & Choi, 1991) argue that zoos should present landscapes and contexts as realistically as possible. Swensen (1984 in Shettel-Neuber, 1988) found visitors spent more time at naturalistic enclosures and visitors felt that animals should have spacious enclosures. Shettel-Neuber (1988) compared visitor responses to 'second generation' and 'third generation' exhibits, and found that visitors clearly liked the third generation exhibits more than the older ones. A second generation exhibit is one which utilises cement enclosures surrounded by dry or water filled moats to display animals. A 'third generation' or naturalistic exhibit is one which "simulates the environmental conditions typical of the habitat of the species exhibited. . . such an enclosure should stimulate its inhabitants to use their repertoire of behavioural, physiological and anatomical adaptations as fully as possible" (Bacon & Hallett, 1981). Coe (1985) refers to 'landscape immersion' and argues that enclosures should provide abundant, believable and reliable cues, that the landscape should "feel" right. The aim is that the visitor experiences the animal as if he/she came upon it in the wild. The success of this depends on how well the illusion is maintained (Wineman & Choi, 1991). Methods of encouraging this illusion include controlling views of other people and animals; limiting people-people interaction by reducing the social area around enclosures; providing self-directed experiences; and allowing the animals to retreat from the public gaze (Coe, 1985). Other factors encouraging an immersion experience include limiting sight of buildings and contradictory visual cues (possibly even exhibit signs) and making the environment as accurate as possible (Bitgood, 1990). In a study using slides depicting animals in different environments, Finlay, James &

Maple (1988) found that the animal's environment influenced the perception of that animal. A visible barrier resulted in respondents perceiving the animal as 'restricted' and 'tame' and this result was the same whether the barrier was a moat or a traditional bar and glass cage. They conclude that designers should lessen the perceptual cues that remind people that they are in a zoo.

Being accurate

Emphasis should also be placed (as far as possible) on accuracy. Wineman & Choi (1991) refer to the development of Atlanta Zoo in the 1950's when enclosures had the appearance of natural areas, but they did not accurately represent the habitats and

Natural environments encourage natural behaviours. Natural behaviours inspire visitors.

groupings of the animals. This hindered the full educational impact of the exhibits. Many modern zoos are now attempting to provide enclosures with vegetation and landscapes which mimic those of the animals' natural habitat. This is not only for the benefit of visitors, but also for animals. Environments which are as natural as possible should encourage the animals to engage in species typical behaviour (e.g., feeding, playing), which in turn is educational and exciting for visitors. Such an approach provides plentiful opportunity for indirect learning - the experience of watching a wild animal interacting with its environment can provide more, and different, information than a sign. Ackley (1936, p. 11) argues the case for accurate presentation of environments when stating "an animal cannot be isolated, even conceptually, from the particular environment to which it has

become adapted ... without a serious misunderstanding of its true nature".

Encouraging natural behaviour

Natural environments encourage natural behaviours. Natural behaviours inspire visitors. It is therefore important to ensure that animals have outlets for the beautiful and fascinating movement typical to their species. Robinson (1994) outlines some methods of functional substitution for wild behaviour. At the National Zoo in Washington DC a mechanical device simulates a moving animal and provides their cheetahs with something to chase. This is not only beneficial to the animals, the sight of a cheetah in full flight is guaranteed to be memorable to visitors. Howlett's Zoo in the UK have a gorilla enclosure where the animals are fed from the top of an enormous wire mesh enclosure. They must continually forage for food, a natural behaviour pattern which keeps them active (Shackley, 1996). Taronga Zoo in Sydney give mongooses whole eggs to eat - it may take them hours to break the shell, but that is how they would deal with eggs in the wild (Dengate, 1993). Markowitz (1979) outlines techniques whereby captive primates 'earn' food through sequences of activities. This provides the primates with the opportunity to exercise, problem solve and have control over their environment. It also provides visitors with unique opportunities to witness species-typical behaviour and the capabilities of the animals. The examples provided by Markowitz (1979) are particularly interesting because the behavioural enrichment techniques were used in traditional bar-and-concrete style cages. It is important to note that naturalistic enclosures do not automatically produce natural behaviours. These depend on a mixture of the animals previous experience, enclosure design and

behavioural enrichment techniques (Shettel-Neuber, 1988). Such methods of behavioural enrichment provide stimulation, exercise and the satisfaction of natural instincts for the animal, and untold learning and appreciation opportunities for the visitor.

Using the sounds of nature

One method which may assist in the more accurate representation of nature is the use of ecologically relevant sounds. A study by Ogden, Lindburg & Maple (1993) found that the use of these natural sounds positively affected the experience of zoo visitors by making them feel as though they were (in this case) in a rainforest. Almost twice the number of respondents reported that they had learned something from the exhibit when the sounds were turned on, and the sounds appeared to encourage appreciation of the natural environment and positive feelings toward the animals. However, it is important to note that the system in question was highly sophisticated, and the exhibit was designed for a landscape immersion experience. Sounds were recorded in Africa using animal vocalisations (birds, insects, monkeys) and environmental sounds (rustling foliage). The enclosure had 111 speakers and 27 sensors which detected visitor movement and controlled output levels depending on crowd size. Furthermore, the foreground sounds such as animal noises were layered randomly on top of the background sounds. Thus the favourable results in this study may not be applicable to less sophisticated systems.

Getting attention

Some studies (e.g., Brennan, 1977) indicate that zoo visitors spend surprisingly little time viewing exhibits. However, traditional exhibits present animals in obvious locations, housed in repetitive enclosures. There is little effort required, no

Table 1: Principles for Attracting the Attention of Visitors

Principle	Application to Zoo Environments
Size	Larger animal size results in longer viewing times
Motion	Moving animals will gain greater attention from visitors
Aesthetic factors	Shapes, colours and patterns increase attention
Novelty/rarity	Visitors are attracted to novel/rare animals
Sensory factors	Multisensory exhibits produce longer viewing times
Interactive factors	Visitors will be attracted to animals they can touch or interact with
Visitor participation	Greater attention and recall are likely where visitors can participate/assist with animals and their keepers, e.g., feeding
Object satiation and fatigue	Repetition of enclosure style is related to decreased attention
Special interests	Visitors will pay more attention to animals they are interested in. Baby animals have widespread appeal
Visibility of exhibit	Barriers to visibility reduce viewing times
Proximity of exhibit	The closer visitors can get to exhibits, the longer they stay
Realism	Naturalistic exhibits provide more memorable experiences
Sensory competition	Exhibit stimuli compete for visitor attention

Source: Moscardo, 1996. For an explanation of these principles applied to zoo settings see also Bitgood *et al.*, 1986.

drama, surprise or novelty. This predictability bores not only the animal but the visitor as well (Bacon & Hallett, 1981). Table 1 (developed from Moscardo, 1996) summarises principles which can be used in interpretation to attract the attention of visitors. These principles are based on variables which have been found to be significantly effect the attention and learning of visitors. Many of these principles can be extrapolated to the zoo environment. For example, popular exhibits at zoos are often those which have large animals (e.g., elephants), rare animals, dangerous animals (lions, tigers, bears) colourful animals or animals of special interest (e.g., new or endangered animals), and infant animals (Bitgood, Patterson & Benefield, 1988; Shaw & Copper, 1980 in Shackley 1996). Active or moving animals also attract attention and visitors appear to spend

twice as long looking at animals that are active as opposed to those which are not (Bitgood, Patterson & Benefield, 1988). The principles discussed by Moscardo also suggest that natural exhibits are more memorable; that barriers to visibility (e.g., bars) reduce viewing times; that being able to get close to animals encourages visitors to stay longer; that sensory competition occurs between exhibits; and that repetitive exhibit style contributes to fatigue and satiation (Bacon & Hallett, 1981). These principles are confirmed in an empirical study by Bitgood *et al.* (1988, 1987). Coe (1985) argues for concealed barriers in suggesting that animals which appear unrestrained should get our full attention. Open areas, natural settings and water features also attract the attention of visitors (Martin & O'Reilly, 1988).

Avoiding incorrect perceptions

Anthropomorphism

How do visitors perceive zoo animals? Coe (1985) suggests there are often contradictions between what zoo visitors perceive unconsciously and observe consciously. Anthropomorphism (transferring human characteristics and motives to animals) has been cited as one of the major problems that zoos face in educating visitors accurately (Ford, 1995). Use of pet names, animal birthdays, adoption schemes and the general handling of animals may interfere with the perception that zoo animals are wild. The difficulty is that anthropomorphism can be a useful technique to engage the interest of the visitors, and children in particular understand anthropomorphic explanations because they can relate it to their lives. Children tend to use anthropomorphic comments to interpret behaviour (Rosenfeld, 1982) and the explanations that parents (particularly mothers) provide to their children are highly anthropomorphic (Wolf & Tymitz, 1981). The question is whether the understanding gained is accurate, and whether anthropomorphism is appropriate.

Wild or tame?

Issues such as anthropomorphism and handling animals can create the impression that zoo animals are not wild animals. Captivity itself contributes to these impressions. Ford (1995) found that 12-13 year old students did not perceive zebras as wild animals. This was the case in empirical studies of both the free range zoo and the small enclosure zoo. However, an important distinction was that the zebras in the free range zoo were not considered tame. Ford (1995) suggests that the reason behind the students not perceiving the animals to be wild was the overriding perception of captivity. Whilst it is true that

zoo animals may not be considered wild because they are captive, it is important not to present them as domesticated pets as this may interfere with encouraging desired messages about behaviour and conservation in the wild (Ford, 1995).

Issues of rank

Coe (1985) raises the interesting issue of the perceptual position of the animal relative to the visitor. If the visitor is looking down on the animal, does this suggest rank? Coe suggests that if an animal is in a "position or location superior to the viewer it may relatively predispose the viewer to want to learn from the animal, be more attentive to it, and perhaps be even more respectful of it" (p. 203). Coe (1985) suggests a number of ways this may be achieved:

- a) person enters perceptual space already occupied by animal
- b) person on edge of space, animal in centre of space
- c) person hiding, sees animal in full view
- d) person looking up at animal
- e) person encounters animal by surprise
- f) person (diurnal) encounters animal in nocturnal habitat
- g) person sees dangerous animal with no visible barrier
- h) person discovers animal very close at hand.

Hancocks (1971) affirms this concept from the animals' point of view, maintaining that animals should never be looked down upon. This is unfavourable because of the psychological connotations inferred, and also because it can be disturbing for animals to view potentially dangerous enemies from such an unnatural viewpoint. However, the assumptions underlying this

philosophy have not been directly tested (Martin & O'Reilly, 1988).

Captive behaviours

Sommer (1972) expresses the concern that visitors and particularly children are learning incorrect animal stereotypes by watching behaviour that is common to captive animals but not in nature. Such behaviour includes animals pacing their cages, swaying, "sexual aberrations, a heavy incidence of aggression, and the blarney common to many animals that don't have anything to do in a concrete cage". Hutchins *et al.* (1984, p. 16) refer to such behaviour when arguing that "if zoo visitors see animals in ugly conditions, engaging in aberrant behaviour, they are likely to feel nothing more than revulsion and its counterpart, pity ... Conversely, animals viewed in naturalistic environments, exhibiting natural patterns of behaviour can inspire appreciation." Exhibits therefore communicate at both the conscious and unconscious levels. While it is obvious that zoos should attempt to avoid such captive behaviours, if they occur it is best to explain how the unnatural behaviour arises and what is being done to manage it (Van den Brink, 1981). There are reports of naturalistic enclosures reducing aggression and stereotypic behaviour in primates and other zoo animals (e.g., Shettel-Neuber, 1985). However, it is important to realise that while typical captive behaviours may be more frequent in unnatural or restrictive enclosures, they are not necessarily removed by placing the animal in a 'third generation' naturalistic environment. Stimulation of behaviour typical in the wild involves the animals' past experiences as well as the design of the enclosure and behavioural enrichment techniques. Thus an exhibit which encourages natural behaviours depends on both design and ongoing management

(Shettel-Neuber, 1988).

Facilitating enjoyment

Most visitors go to the zoo for an enjoyable day trip, particularly family groups and visitors with children. A study reported by Shackley (1996) found that in 1992, 48% of respondents went to the zoo for a day out, and a further 40% to entertain children. Enjoyment is therefore a primary concern. Wilson (in Robinson, 1994) refers to 'biophilia', or the fascination humans have with other living things, to partly explain the popularity of zoos. Given our natural attraction and interest in animals, a zoo which presents healthy animals behaving naturally in appropriate, naturalistic enclosures is more likely to create visitor enjoyment.

Knowing what visitors don't like

A useful way to approach the issue of creating enjoyment is to look at what visitors don't like about zoos. Wolf & Tymitz (1981) found that people did not like exhibits where they could not see the animals, where they were concerned that the animals were

not comfortable and unhappy, and where animals were displayed in small, unclean or inappropriate settings. Many visitors dislike seeing other visitors feed the animals, and feel the zoo should take stronger measures in warning visitors not to feed the animals (Wolf & Tymitz, 1979). Further, visitors did not like crowds as they interfered with their view of the animals, or zoos with poor orientation which resulted in them getting lost. Wolf and Tymitz concluded that "visitor reactions to the integrity of exhibits was a major factor influencing the total zoo experience" (1981, p. 51) and that "one criterion was clear: captivity must be comfortable" (1979, p. 22). A 1992 study by Shackley (1996) found that when asked what most annoyed them on their zoo visit, 25% replied 'not enough space for the animals' and 15% replied that the 'animals seemed unhappy or disturbed'. This supports the idea that exhibit design is crucial. Other important responses were 'not enough information about the animals' (10%), 'some animals you wanted to see were not on display' (9%) and 'too many

people to allow good view of animals' (5%).

Dealing with animal inactivity

Visitors find the inactivity of animals frustrating (Bacon & Hallett, 1981). This is a problem for zoos attempting to replicate the animal's natural habitat - they are often well camouflaged and retreat from public view. Once at the zoo, some visitors want to see the animals perform, and popular animals are those which interact with the visitor or other animals (Wolf & Tymitz, 1981). Bitgood, Patterson & Benefield (1988) found that viewing time of visitors was doubled when the animal was active, and this seemed to be true for all types of behaviour. Modern audiovisual equipment can help solve this frustration. Film loops, audio tapes and interpretive signs can help to satisfy the visitor's curiosity. Adding motion to the exhibit, such as water features and short film clips can also assist in holding visitor attention. Bitgood *et al.* (1986) suggests that visitors need to be educated about animal activity. Many species (such as big cats) are rarely active and if visitors are told that they should not expect activity from these species, their viewing experience may be less disappointing.

Dealing with animals that are difficult to see

Naturalistic exhibits can mean that animals utilise their camouflage capabilities effectively. While natural habitat exhibits provide numerous benefits to both animal and visitor, Churchman (1985) points out that some visitors walk away from such exhibits because they cannot find the animals. Polakowski (1987, p. 2) summarises this difficulty:

the display of animals in captivity presents a dilemma between the inherent nature of nearly all animals to resort to

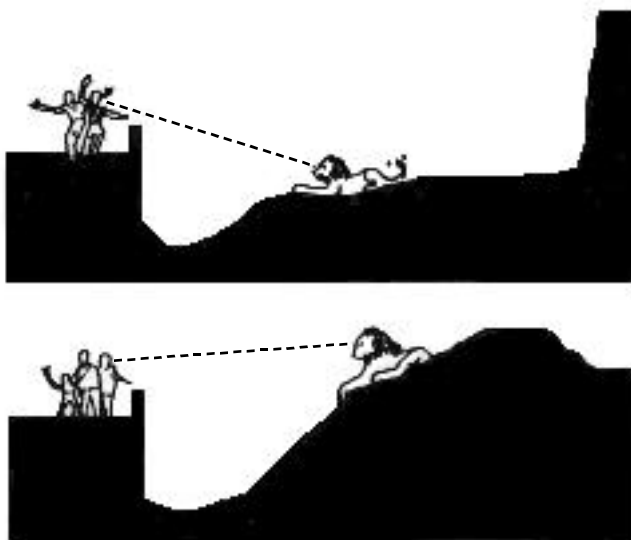


Figure 1: Relative position: Does it affect perceptions?

Source: Coe (1985, p. 204)

deception for protection and the need to display them in settings where they are easily seen and recognizable by zoo visitors.

This dilemma provides an opportunity for interpretation to change a potentially negative impression (not being able to see the animal) to a positive learning experience in terms of respect for the camouflage capabilities of the animal. Interpretive signs can ask the question "Can you see me?" and give suggestions for finding the animal. Exhibits can also be designed with multiple viewing platforms designed to aid visibility and recognition, provide life-sized models of smaller animals or include good quality graphics in the event that the visitor does not see the animal. Much of the difficulty stems from the visitor expectation that they should be able to see the animals at the zoo. Interpretation can alter these expectations by explaining why visitors may not be able to see the animal immediately. Doing so may reduce potential disappointment and frustration.

Meeting the needs of children

A necessary condition for an enjoyable family day is the enjoyment of the children. Parents often plan their zoo visit for the children's benefit, thus catering for children is critical (Rosenfeld, 1982). Most zoo visitors are in family groups, and children under 12 make up over 33% of all visitors (Wineman, Piper & Maple, 1996). At the basic level, catering for children includes adequate toilets and facilities for families, and paths that are accessible for strollers. Wineman *et al.* (1996) suggest that zoos are missing opportunities to capture the attention of young children and teenagers. They suggest that children need experiences that are appropriate to their age such as manipulative materials, pictures, small intimate experiences and places to let off steam. Interactive experiences,



Figure 2: Visitors at an animal hospital

contact with animals, and opportunities to talk to keepers are also suggested as methods of reaching young children. Learning through play is also effective, where children learn about animals by imitating them (Wineman, Piper & Maple, 1996). Ollason (1981) highlights the importance of animal signs aimed at very young children. These have basic information and attractive graphics and have proven popular at Edinburgh Zoo. Martin & O'Reilly (1988) illustrate the importance of including children in visitor research at zoos. For example, one zoo assumed it was meeting the needs of children until empirical studies found that children encountered obstacles to learning such as visual barriers, competing sources of stimulation and interpretation designed for adults (Martin & O'Reilly, 1988). Martin & O'Reilly (1987) recommended incorporating factors which usually distract children (such as movement and water) into the exhibit design. Deans *et al.* (1987) conducted surveys of

children and adult zoo visitors and recommended that children be provided with sensory and tactile experiences which enable them to learn through observation and physical activity. Examples include replica models of animals next to exhibits which children can touch and manipulate, and the use of elevated viewing platforms.

Providing opportunities to get close and nurture

Children, as well as adults, are particularly attracted to the opportunity to nurture. This makes nurseries and animal hospitals particularly popular. Bacon & Hallett (1981) recommend using an 'open window' exhibit, where visitors can look directly into the keeper's work area. Routine work such as weighing animals is done in public view.

At the World of Birds at New York Zoo, the display area for hand-reared birds was so popular that they needed to build a new nursery with large viewing areas

(Bruning, 1981). These areas provide the opportunity for visitors to get close to the animal and ask questions of the keepers. Such opportunities provide enjoyment (Figure 2).

Providing high quality interpretation

Signs

Signs and labels are integral to the exhibit as a whole. The animal is of primary importance in the exhibit, “yet to the untrained eye and without proper interpretation it remains of only slightly more interest than an animated toy” (Blakely, 1981, p. 1). A study of school children found that exposure alone to wild animals appeared to be insufficient to obtain affective and cognitive gains. This casts doubt on the traditional approach which has been to simply expose children to animals and assume this resulted in improved attitudes toward wildlife conservation (de White & Jacobson, 1994). Signs therefore are essential in assisting visitors to interpret what they see. They are also particularly important in exhibits where the animals may be difficult to see. There are a number of ways that signs can be designed to encourage the visitor to read and understand them. Table 2 provides a summary.

Live interpreters, interactives and shows

Live interpreters (such as keeper talks) and animal shows are popular at zoos because they combine many of the features of exhibits that attract the attention of visitors (Table 1). They are interactive, often involve some level of participation, visitors can get close to the animals and have good visibility, and often the animals are displaying their natural behaviours. Morgan and Gramann (1988) found that mere exposure to snakes did not improve positive attitude scores, however ‘modelling’ (watching a keeper handle the snakes

Table 2: Principles for Effective Signs.

Principle	Explanation
Emphasise important points	Underlining or otherwise drawing attention to the point aids learning (Kool, 1985)
Use point form	Readers prefer this to the paragraph format as it appears shorter and easier to read (Woods, Berry & Moscardo, 1996)
Use headings	Headings provide clear visual cues to indicate what is important. They allow the visitor to select topics of interest and assist in recall of information (Hartley & Trueman, 1983)
Order your information	Primary information, that which can be visually verified or understood by looking at the exhibit, should be the first thing visitors read. The secondary information, which goes into more detail, follows the primary (Serrell, 1980)
Emphasise information with “visual content”	This is information that directs the visitor’s attention to the exhibit by asking questions, or makes comparisons using information which can be visually verified (Serrell, 1981)
Keep labels succinct	Reading decreases as the number of words increase. (Borun & Miller, 1980). The general consensus is that signs should have around 50-75 words (Davenish, 1990; Borun & Miller, 1980)
Use a clear font and large lettering	This makes signs easier to read (Borun & Miller, 1980)
Use colour and contrast	Colour and contrast can invite reading behaviour, and makes a more lasting impression on the reader. Bright colours command more attention, and dark letters on a light background are more readable than light letters on a dark background (Knudson, Cable & Beck, 1995; Wolf & Smith, 1993)
Use photographs and other illustrations	These can present information in a way that would be difficult to describe with words. They add to the appeal of the sign and help the reader interpret the information (Borun & Miller, 1980)
Use signs with catchy phrases, interesting titles, novelty, conflict and surprise	These catch the attention and interest of visitors (Moscardo, 1996; Serrell, 1981)
Ask questions	Questions can arouse the curiosity of visitors and draw their attention to the exhibit. Care must be taken to ensure the questions are not too difficult or wordy (Serrell, 1981; Kanel & Tamir, 1991; Moscardo, 1996)
Use an active writing style	Use a writing style which involves the visitor. Visitors approach the text in an interactive manner, as if someone were talking to them. This aids interaction and discussion (McManus, 1989; Rand, 1985)
Use personal connections	This helps visitors to relate to the information. Examples include comparing zoo animals to pets, making reference to the everyday lives of visitors (Tilden, 1977; Serrell, 1981)
Use humour	This can illustrate points and increase enjoyment (Bruning, 1981)
Use models	Models can assist explanations and can be particularly useful when dealing with small animals or insects, by providing a clear view of the animal in question (Ross, 1981)
Use age appropriate signs	Include some signs for young children (Ollason, 1981)

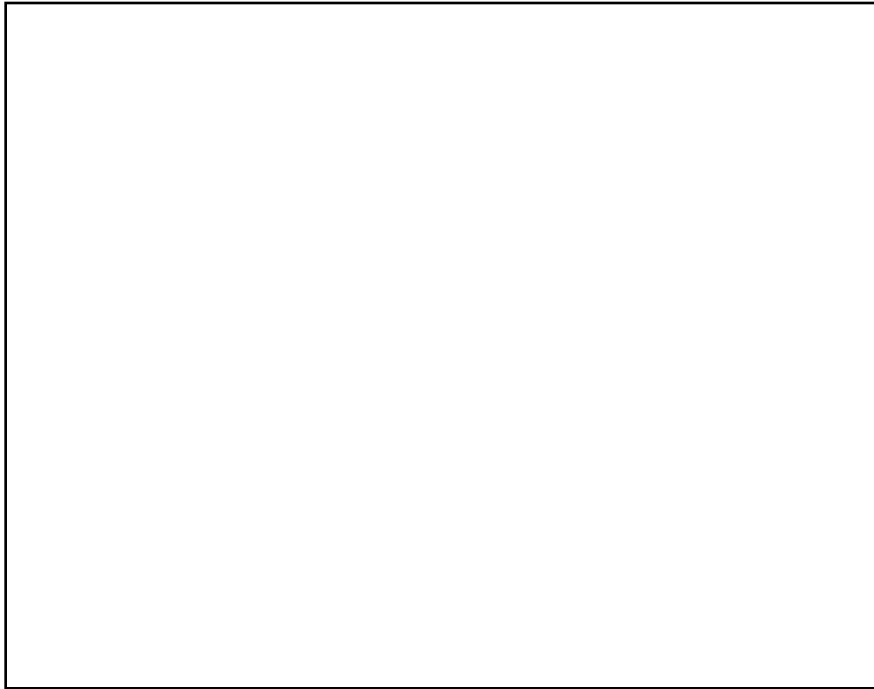


Figure 3: A negative image

enclosure, staring up at the blue sky, or the brown bear in a concrete pit. The zoo's guide book recognised the inappropriateness of these enclosures, saying that the eagle was injured and cannot be released, and "we agree that her (the bear's) enclosure is not ideal, but it has been improved with a deep litter of bark and we have no plans to house brown bears when she is gone" (Smith, 1997). However, visitors may not read the guidebook. At an English zoo, a gorilla stood at the bars to his cage, gazing into the faces of passing visitors. Few visitors stopped for any length of time, and many expressed discomfort with the experience (Figure 3). Are these the memories we want visitors to take away? Can any amount of positive education erase these memories and the feelings they evoke?

Compare this with the comments from visitors exiting a nocturnal house in Australia. Many in the group said they felt like they had entered a secret world, and were thrilled to watch a platypus foraging for food on the simulated creek bottom. Or comments from visitors to the National Zoo in the USA, saying "I could watch the birds in here all day...this area is perfect for them. Its like a tropical garden. They look so natural in here." (Wolf & Tymitz, 1979). There is a need for continuing research to determine what characteristics and interpretive methods contribute to enjoyment, learning and appreciation. There is also a need for these methods to be workable in the daily practical management of zoos.

Conclusion

The goals of zoos have changed from that of pure entertainment or scientific study to broader goals of recreation, education, research and conservation. To achieve these goals with people and families at leisure requires careful planning and interpretation. The rare, exotic and

confidently) and direct contact opportunities improved attitude scores significantly. Wolf and Tymitz (1979) suggest that visitors have an unmistakable desire to ask questions, listen to responses and continue asking. They believe that questioning reflects a desire to learn, and the ability of keepers to answer questions and thereby facilitate learning explains why keeper talks are so popular (Wolf & Tymitz, 1979). Use of shows and live interpreters are particularly good for children (Wineman *et al.*, 1996). Being able to talk to keepers gives visitors a 'behind the scenes' appreciation of the animals and the zoo in general. These provide the opportunity to discuss wildlife issues and provide direct animal contact experiences under controlled supervision (Wineman *et al.*, 1996). Shows that encourage animals to illustrate species-typical behaviour can be educational as well as entertaining. However, care should be taken to avoid anthropomorphising live animals or turning the show into an exhibition purely for entertainment.

Computers and interactive multi-

media software are being used at some zoos. These can be useful for children and visitors with limited mobility, as well as having potential for use by public and educational institutions outside of the zoo. Detroit Zoo opened a new exhibit called the Wildlife Interpretive Gallery in 1996 (D'Angelo & Cavagnol, 1996). This uses photographs, video and audio elements to provide interactive information on items such as 'how do we save the animals' and 'behind the scenes at the zoo' along with information on species exhibited. Initial feedback for the exhibit was positive.

Creating memories

Evaluating specific learning and attitude change in zoo visitors is difficult. This may be because visitors take home a mixture of perceptions, feelings and information which may be difficult to quantify and express. What do people remember? Often it is the things that caught their attention. Some examples of negative memories are from a zoo in Scotland, where a visitor remembered the golden eagle at the top of its small mesh

beautiful animals are the most important focus for achieving these goals. Their activity and behaviour in natural environments can often trigger wonder and appreciation in the humans visiting them. However, visitors need assistance with interpreting what they see and hear. It is important to provide them with information that is accessible and interesting through signs and other interpretive techniques. Yet it is just as important not to give them incorrect information and misleading perceptions through presenting wildlife in a manner and in environments that are completely alien to their natural state.

The principles presented in this paper are based on a wide range of studies on the interpretation of wildlife in captivity. Much of the research in zoos has been driven by practical problems rather than

the need to develop or test theory (Martin & O'Reilly, 1988). Thus many studies are site specific and results are not easily condensed into general principles. However, there are a number of theories which are potentially useful to interpretation in zoo environments. The concept of mindfulness (Langer, 1989) as applied to interpretation (Moscardo, 1996) provides a useful theoretical base from which research results may be generalised across settings. This theory is able to identify features of exhibits which are attractive to visitors. Kellert (1996) describes factors which shape attitudes towards wildlife, and these factors may provide avenues for research in terms of visitors' perceptions of species. Overall, there is a need for continuing research to guide the development and management of zoos for the achievement of educational and conservation goals.

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