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Plan Ahead for Behavioral Enrichment in Environmental Enrichment Kaleidoscope: *Research, Management and Design*

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Opening Scene

Kid(visiting zoo): "This animal is boring!"
Lion (living at zoo): "I'm bored."
Kid"It doesn't do anything!"
Lion "There's nothing to do. Meal time isn't until sunset."
Kid"... and look how fat that lion is! Bet he couldn't catch any zebras."
Lion "Should I mark my turf again? Naw, I've already done that 12 times today. Wish I could see what's going on next door." (Lion wanders back to shady spot in corner of exhibit).
Kid"That does it. Now I can't even see him. Next time I'll go to the mall!"

NATURE DOESN'T NEED ENRICHMENT

Wild animals must be thoroughly adapted to their environment in order to survive. But zoo animals have lost their natural occupations of hunting for and processing food, avoiding predators and defending their territories (Hediger 1950). In return, however, they are protected and lead lives of leisure, boredom and perhaps frustration. Thoughtful caregivers respond with remedial strategies ranging from simple toys to sophisticated gadgets. These are valuable interventions, but, like a doting parent responding to a deprived child, they rarely solve the basic problem. Furthermore, these actions are usually guided by human behavioral bias -- that **we** know what's best for **them**. This homocentric paternalism may prevent us from recognizing the importance of choice in lowering stress and developing a sense of self-worth.

Enrichment Level One - Zoo Toys

O'Neill (1988) and many others have experimented with remedial behavioral enrichment devices for some time. The most simple are toys such as tires, balls and beer kegs. More sophisticated devices simulate occupational behaviors such as hunting and processing food. In evaluating the performance of these toys, behaviorists generally agree with the overall value of this approach. Designers should learn how to build in such simple

devices to enhance the educational intent of the exhibit. For example, balls could be made to resemble large tropical fruit, tortoise shells or other items found in the animals' natural habitat.

Enrichment Level Two - Occupational Simulators

Markowitz (1982) experimented with mechanical devices which stimulated the prey-catching behavior of small carnivores. While some of these features lacked unpredictability of movement, they were positive early responses to sterile zoo habitats. Hancocks (1980) responded by suggesting that the sterile habitats should be changed instead, a point with which Markowitz agreed (Forthman-Quick 1984). Chemove (*et al* 1982) pioneered the use (and study) of deep-litter bedding as enclosure substrate and the practice of scattering treats into the substrate to encourage foraging. I helped design devices for anchoring browse branches which were built into the outdoor gorilla habitats at Woodland Park Zoo in 1976. But they were built to withstand the gorilla's force and proved to be too heavy and impractical for the keeper. Browse materials are more commonly used for giraffe or other hoofstock.

Other devices for simulating food gathering occupations include "finger mazes" for primates. Perhaps similar devices could be developed as tongue mazes for giraffe, anteater, kinkajou and other animals with prehensile tongues.

Shepherdson (1991) describes a variety of cricket and meal worm dispensers, some very simple to use. The challenge for exhibit designers is to incorporate such devices effectively into the initial design of new facilities.

Today there is increasing interest in adapting lure coursing devices developed for coursing hounds to use with cheetah, as well as wolves, hunting dogs and other wild canids. During the past 23 years, I participated occasionally in lure coursing events with my own basenji and saluki hounds. The lure coursing hardware has become increasingly easier to use. This device consists of a motor, and up to one-half mile of strong monofilament fishing line to which a lure of white plastic strips is attached. The line forms a continuous loop and is arranged around pulleys staked into the ground in any configuration. The entire assembly is easily portable and can be set up in a matter of minutes. The course can be easily changed to add novelty. It can cross streams and gullies or enter borrows. Currently, Don Lindburgh is experimenting with this device with cheetahs at the CRES facility at the San Diego Wild Animal Park. Early results are very promising.

The problem with the device is that it cannot be installed permanently because the animals could chew the line. Also, animals could be cut or tangled in the line, although this has rarely occurred among the thousands of coursing hounds that have used the device for years. I am concerned that developing a permanent installation would cause predictability and loss of interest by the animals.

Another issue is that this activity requires a larger area than many zoos have available. However, a miniature version for smaller coursing predators should be considered.

Enrichment Level Three - Environmental Choice

The discussion to this point has dealt primarily with remedies for inadequate facility designs. This problem may stem from a limited view of the interrelationship between wild habitat and wild behavior, and from our homocentric bias.

Natural Gradients - Natural landscapes are replete with overlapping environmental

gradients - warm to cool, high to low - light to dark, wet to dry. The animal meets its environmental and behavioral needs by moving among these gradients to find the combination of features which best meet its needs at the moment. It exercises choice, as its ancestors have since life began.

Hediger (1950) discusses the popular misconception that wild animals are "free" when in fact they are constrained by many behaviorally imposed barriers. He said that neither wild nor zoo animals are truly free. However, there is a major difference. One could argue that an animal with the most choices has the most freedom. In human society, the most heinous crimes are punished by death - the complete absence of choice. Severe crimes are punishable by solitary confinement - near total absence of choice. Even the paroled felon has limited freedom of choice.

Most zoo animals, though guiltless, have very limited "freedom" because they have very few choices. We make most of their choices for them. We decide when they eat, exercise and procreate. In our wisdom we have legally mandated that the complex interweaving of natural gradients be replaced with uniform light, temperature and humidity standards. It is our homocentric bias to assume, without question, that we know what is best - that we are better able to make choices for the animal. This is nonsense. It may be harmful nonsense. Snowdon (1989) has shown that macaques without choice have higher levels of stress than macaques with choice in parried experiments. Laule (this conference) describes trained chimpanzees which choose to present their arm for injection rather than being darted with the same injection. We know from our own lives the frustration and loss of self-esteem which results from having things done for us that we would rather do for ourselves. No doubt, prisoners experience this frustration acutely. Perhaps many zoo animals do also.

Artificial Gradients - One solution to this problem is for facility designers to intentionally build-in as many overlapping gradients as possible. Heating systems can be designed to provide areas of variable temperature and humidity. The Great Ape facility at Lincoln Park Zoo is a fine example of variable light levels based on a forest-like vertical gradient. Heated or cooled artificial rocks or logs and underwater jets of warmer or cooler water can provide temperature gradients in both terrestrial and aquatic habitats. In this concept, the gradients are built-in and the animals choose the combination of factors most suited to their needs. Sometimes spatial limitations make extended animal movement impractical. Why not let the animal indirectly manipulate the artificial light, temperature and humidity levels within broad predetermined ranges? Animals could turn on basking lights, for example, by activating a remote motion detection device focused on a basking perch. The light could be on a timer or other device to control overexposure. It would be exciting to "brainstorm" how many ways could be devised to give zoo animals control over their environmental systems.

Social Choices - Relative position is important in dominance hierarchies of social species. Designers must also provide animals with abundant choices in meeting these needs, such as display areas, promontories, areas to hide from other individuals, and areas for group activities such as play or grooming. While designers usually provide such facilities, it would be interesting to find ways for the social animals to manipulate the environment to help meet their own social needs. Alternatively, the habitat could be designed to be easily changeable to allow observation of animal use for appropriate (animal suggested) changes to the habitat.

PLAN AHEAD FOR BEHAVIORAL ENRICHMENT

Enriched habitats result from an enriching design process. An individual designer, no matter how well informed, cannot match the collective knowledge and creative capacity of a diversified and motivated group. Exhibit design should involve a group, including specialists in the fields of ethology, research, training and education, as well as designers and caregivers. Good exhibits are educational and are rich in research opportunities. Animal and staff training help them achieve to their full potential. Close collaboration can build lasting relationships and mutual respect, insuring the optimal management and modification of the project over time. Positive interaction among a diverse design group, which could also include fund-raisers or potential donors, develops shared ownership and a strong constituency to support the project's completion. This is a major benefit of the collaborative design process.

Designers must realize that our role, while crucial, is also ephemeral. The animals will live on in the habitat for a long time. We can never anticipate all of the animals' needs. Oversights and mistakes will happen. New opportunities will emerge. By acknowledging these factors in advance, we can provide access for equipment to modify exhibits in the future.

Observation and evaluation make design a continuous self-correcting process. As a result, behavioral enrichment will evolve from remediation to facilitation in the creation of artificial habitats that have diversity and choice, and resemble natural habitats in function as well as appearance.

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