



THE ROLE OF BEHAVIORAL MANAGEMENT IN ENHANCING EXHIBIT DESIGN AND USE

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Introduction

Heini Hediger, that sage visionary who in the 1950's wrote on the care and treatment of wild animals in captivity, warned that the idea of imitating nature in captivity is a mistaken objective that can have serious repercussions. "What cannot be avoided in keeping animals in captivity, is isolation from the cycle of life; therefore a fresh artificial cycle must be created. Naturalness in the treatment of wild animals does not consist, therefore, of a pedantic imitation of one model section of nature. It means that a substitute for it must be found suitable for animals, taking into account the new conditions of life in captivity" (Hediger, 1950).

With those words in mind, some observations about a wild animals life in captivity can be made. These animals are spatially limited, in an environment that is sterile and unchanging in comparison to the wild. There are no predators or prey, and the number and types of other species encountered is severely limited. Social contacts of conspecifics are restricted to whomever is in the enclosure. They must eat a fixed diet, when and where it is offered. Overall, animals are denied the need and often the opportunity to engage in purposeful behaviors. Furthermore, as their human caregivers we determine when and where they move; when necessary we separate, confine, and restrain them, examine, inoculate, and anesthetize them. And although we know why all these actions are important, they are often in direct conflict with the natural behavior we're trying to preserve. The net result is an overall loss of choice and control for captive animals.

So, given these realities of captivity, how do we create that "fresh artificial cycle" Hediger spoke of? If we acknowledge that an exhibit is first and foremost a living space for an animal or animals, how it looks (the form), and more important, how it works (the function), are the significant elements to focus on.

In recent years we have done remarkably well on form. Armed with natural history and ethological information, as well as field research findings, naturalistic immersion exhibit design has come to fruition. The result is great looking exhibits that are, at the same time, suitable biological environments for captive animals. However, even as well done immersion exhibits provide much improved physical environments, in function these new, improved exhibits still fall short. Filling the enclosure with appropriate vegetation, swinging vines, running streams, and manmade caves is a good beginning, but it is not enough. The environment in the wild is a reactive one. Under each rock is a potential bit of food, behind each bush a potential predator or prey, high in each tree a potential refuge. It is the function of these environmental features that make them significant. However accurately this environment may be reproduced in a zoo, it is a passive one; it gives nothing back.

So the greatest challenge, it would seem, is to address the function of zoo exhibits. How do we design and build habitats that are useful to the animals, that encourage species-typical purposeful behavior, that provide greater opportunities to exercise choice and control in their lives, and that help them cope with the necessary routines of captivity with the least amount of stress? In this author's view, a concerted effort is required to address animal needs from the conception, design, and construction of a new exhibit, to the daily care and management provided the animals that inhabit it. To that end, facility design and behavioral management are symbiotic processes which offer varying contributions to form and function.

Behavioral management, as we define it, is a comprehensive, proactive approach to addressing animal maintenance and well-being. The primary technical components are environmental enrichment and positive reinforcement training. By using these tools in a flexible, complementary fashion, the individual strengths of each is greatly enhanced. Behavioral management as a problem solving approach is rooted in the scientific method: assess a situation, develop a hypothesis, implement a strategy, check results, modify strategy if necessary, re-check results, etc. Objective measurement of results is an integral part of the process. I believe that behavioral management has particular value in addressing three elements of exhibit design and use: (1) animal care and husbandry; (2) expression of species-typical behavior; and (3) the visitor viewing experience.

Animal Care and Husbandry

The comprehensive use of positive reinforcement training has revolutionized the way we care for captive animals. So many opportunities are opened up, including the ability to access animals daily for visual inspection and physical examination; to perform veterinary procedures such as blood and urine sample collection on a regular basis; and to give injections with the voluntary cooperation of the animals. Training techniques provide the ability to access animals for these procedures without restraint or separation from cagemates. Overall management of animals is also improved with training. By gaining the ability to shift animals between areas quickly and reliably, greater flexibility in where, when, and how often animals are moved to different areas is the benefit. It also allows more frequent keeper access to the exhibit for enrichment purposes.

All these benefits, plus many more, are most effective if the facilities support these progressive practices. In that respect, the design phase of new exhibits would benefit greatly from the integration of a behavioral management agenda into exhibit specifications. Some examples of specific facility elements that contribute to enhanced husbandry and care include:

good visual access for keepers to animals in all areas

multiple access points for keeper/animal interaction both on and off exhibit, including spaces large enough for multiple keeper and multiple animal interactions

multiple shifting points between areas that allow keeper access to animals as they move and allow animals to shift toward keepers rather than away

built-in mounts for husbandry apparatus such as blood collection sleeve, blood

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pressure cuff, and urine collection pan

good lighting and large enough mesh access points for safe treatment of superficial wounds and delivery of injections

multiple and connected off-exhibit spaces with no dead ends, and with some dividers that allow protected visual and tactile access between animals for enhancing introductions and supporting easy separation of socially housed animals

multiple exhibit spaces for animals to be moved to, expanding the “new” areas that animals can explore on a regular basis

Finally, in working with keepers at many different institutions, the most often reported training problem is shifting animals from the exhibit into the holding area at the end of the day. This is particularly true when animals are then kept in the holding area overnight. The reason seems painfully obvious. Holding areas are traditionally, and remain today, much smaller, more sterile environments than exhibit areas seen by the public. Holding areas are also where many animals spend the majority of their time - likely twice the time spent on exhibit. To avoid this shifting problem, and enhance animal well-being, holding areas should be designed to serve as the primary housing areas that in reality they are. That means making them pleasant and interesting areas with soft substrates and other diverse environmental features. That requires greater resources in behind-the-scenes facilities, but if animal welfare is a serious goal, this must be addressed.

Expression of Species-Typical Behavior

The evolution of naturalistic immersion exhibits has come a long way in providing an array of appropriate environmental features for captive animals. However, a real litmus test in determining whether an exhibit "works", is how much the animals use it. All too often the result is less than ideal. Problems range from excessive inactivity to unwanted stereotypic or abnormal behavior. In short, it is not enough just to provide environmental features that allow for the expression of purposeful behaviors. It is equally important, and a greater challenge, to find ways to encourage this desirable behavior to occur. I believe both these components should be addressed when designing an exhibit, and that the process would benefit from the integration of a behavioral management perspective.

Perhaps the best analogy is to look at the basics of training an animal to perform a behavior using positive reinforcement. The process has three parts: a stimulus or cue, the performance of the behavior, and the reward or reinforcer. It is the last part, the reward, that is responsible for increasing the likelihood that the behavior will occur again. Whenever I train any behavior, from a dolphin performing a forward flip, to a chimpanzee voluntarily

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cooperating in a blood draw, to a great extent it is the reinforcers I use, and how I use them, that ultimately determine if I will get the desired behavioral results.

Now look at this same paradigm in nature. A cat hears a rustle in the bushes - the cue. He moves quietly through the brush, crouches in position, and pounces - the behavior. He catches a vole and consumes it - the reward. Now he won't get rewarded every time, but he must get reinforced often enough to maintain the behavior. This logical progression, with varying degrees of subtlety, applies to any behavior that occurs. A raccoon wades into water because of the possibility of catching a crayfish. A primate climbs to the top of a tree because it makes a safe resting spot. A bear pulls apart a rotten log because there might be some edible insects inside. These are all examples of purposeful behaviors that continue to occur because there is a good enough reward, often enough, to maintain them.

Now look at this same paradigm in a naturalistic zoo exhibit. There are very few cues - rustling bushes, warning calls, or unexamined rotting logs - that have significance to wild animals. There are far too few rewards to be gained - prey to catch, predators to successfully avoid, berries to pick, roots to dig up. Consequently, very little of the natural behavior that is dependent on these cues and rewards occurs. Furthermore, the simple fact that captivity provides so many of the basic needs or reinforcers of animals - food, shelter, protection, social contacts - without the need to work for them, the very basic bias for conservation of energy comes into play. In a very real sense, I believe many of our animal management practices reinforce a sedentary, inactive lifestyle.

So, how can we create exhibits that encourage species typical behavior? First, I would encourage exhibit designers to confront the same issue animal trainers do - how do I make it worthwhile for these animals to engage in desirable behaviors? One answer, I would suggest, is to turn a naturalistic exhibit into a habitat simulator. A place where cues and rewards are cleverly built into the environment in many unpredictable and changeable ways. To do this requires planning and building exhibits that include a layer of built-in conduit as well as universal attachment points throughout the facility that can support a wide range of apparatus, sound equipment, and mechanical devices. Possible apparatus include: various feeders to deliver food items at the site as in honey stumps and termite mounds, or that scatter, catapult, or drop them; spritzers to release scents; servo switches to rustle bushes or other vegetation; and speakers to input different sound cues. Most importantly, some of these attachment points should be accessible from outside the exhibit. They can be camouflaged in recesses of walls and ceilings, in hollow artificial logs, rocks, and trees, in underwater crevices, and among vegetation. Keepers can use these areas as hiding places for food items, requiring some effort from the animals to attain, instead of simply scattering food around the exhibit. It is also important to include these features in holding areas. Apparatus can be run manually, by computer, or on a simple timer, the latter two options working well in nighttime quarters where keepers will not be present for extended periods of time.

Studies on the relative enrichment value of different objects and activities have

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shown repeatedly that variety and novelty are key components in increasing the time animals spend engaged in the activities. Mench (1994) writes that the presence of novel aspects of environments increases investigative or exploratory behavior. Carlstead (1991) reports that maintaining multiple objects in a bear exhibit helped to counteract general habituation to new objects. Based on this information, I would suggest that one feeder or device is not enough, and will ultimately have little value in significantly increasing species-typical behavior. The goal, therefore, is to provide multiple items, that with a broad network of access points and service ports, can be turned on and off, swapped out, moved around, and expanded regularly.

Futhermore, these points should be strategically placed to encourage maximum use of the exhibit: in pools and streams near viewing windows, at the end of a deadfall, and in the middle of an optimal viewing area. It is very important, too, that many of these elements be included in holding areas, where many animals spend the majority of their time. It seems logical to assume that animals that engage in desirable behavior, even when they are not in public view, may be likely to spend more time overall performing purposeful behaviors. Clever design may allow exhibit and holding space to utilize the same attachment points, using common walls and adjacent spaces.

Finally, behavior can be cued and rewarded by direct human intervention as well. For this reason, multiple keeper access to exhibits and holding areas is most desirable. In some cases, "natural" behavior can actually be trained in the holding area, then transferred to the exhibit, and eventually triggered by more subtle environmental cues.

Planning for this type of exhibit, including what behavior to elicit and how and when to do it, would benefit from a familiarity with ethological information on the specific species. Some species have been studied enough that time budgets have been developed, including what percentage of the time they spend hunting, sleeping, traveling, foraging, etc. This information can then serve as a model for planning behavioral activity in the exhibit.

The Visitor Viewing Experience

In addressing this third element of exhibit design and use, if animal care issues have been comprehensively addressed, and species appropriate behavior has been increased as previously described, the public will already be viewing an enhanced and much more interesting exhibit. But behavioral management can also add another layer to the viewing experience by blending the species typical behaviors triggered by enrichment apparatus and activities into respectful yet entertaining presentations. Behavior can be cued through subtle environmental events - the emittance of an odor, a bird call, the rustling of brush, or the appearance of a simple visual item. The resulting behavior can then be interpreted to the zoo visitors. Or a series of behaviors can be woven into an intricate demonstration of some biological or ethological concept such as predatory behavior, or animal adaptations. It can be as simple or as complicated as desired. Behavior can also be cued and reinforced directly by the keeper or presenter.

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In any event, certain design features will enhance the opportunity for these kinds of activities to occur. First, by using multiple sight lines and different levels, several intimate viewing areas can be created. Second, again keeper access is critical. If keepers have access directly to the animals, they can cue and reward animals out of public view. If they have off-exhibit access to enrichment devices and hiding places, they can stimulate activity and behavior without interacting directly with the animals. Finally, if keepers are also interpreters, they need access to both animals and visitors at the same time. The more flexibly and creatively these contingencies are met, the greater range of presentations that can be offered.

Conclusion

There are many benefits to the integration of behavioral management in the design process. However, the process is an intensive one. To design, build, and maintain an optimum physical and behavioral environment for captive animals has large financial implications. Significant resources must be allocated to the task of turning exhibits into habitat simulators, and holding areas into primary living spaces. It is not a simple exercise. But the benefits, to personnel, the animals, and the public are great.

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