This is the Power Point I had intended to present to the ZSL Planning Group moderated by Teague Stubbington via Skype on 30 July 2019. Unfortunately I didn't operate the Skype connection properly and this presentation was not available for that meeting. Therefore I have added presentation notes so it can be used as a planning resource.

Trends of interest:

1. What's the message? "Immersion", "Authenticity"
2. "Design for Wellbeing" and Animal Welfare becomes first among equals in zoo design & management
   - Welfare Domains
   - 5 New Freedoms

3. "Mixed Species Rotation", "Animal Trails" and "A Walk in the Park".

4. The "Un-Zoo" Alternative & "Third Generation Conservation"

5. Physical, behavioural and social competence of zoo animals

6. Stake-holder Rights Charter

7. Future sustainability

These are the subjects I'd like to cover after discussing your program and objectives with Teague previously.

1. What's the message?

- To Visitors
- To Community & Critics
- To the Animals
- To Staff

1. Everything we do or say, from the way we dress to the speech accent we use and our body language sends a message, intentionally or otherwise. So let's be intentional and clear about our work and its embedded messages.
2. If a zoo were to spend money on media or advertising rather than a new animal area, what would the message be? Perhaps that is the message you should embed in your new zoo exhibits.
3. Remember every communication has two sides, what the sender wants to say and what the receiver is willing to hear.
4. To be successful, it is the sender's responsibility to find a message and delivery system interesting and compelling to its audience.

What's the message?

Message: the actual multisensory communication received and remembered by zoo visitors.

- **Affective** (emotional) filtered by the setting, distractions, prejudices or attitudes of visitors themselves.
- **Cognitive:** facts or concepts from the actual interpretation
- The message that counts most is the one the visitor remembers.
- Serrell* emphasizes the importance of clearly defining the "message" as the first step in the exhibit design process.
- Since the message is communicated through the entire immersive environment, the entire team of designers, educators and other stakeholders should participate in framing the intended message.

*Serrell, B., 1983: "Making Exhibit Labels, A Step By Step Guide." American Association for State and Local History, Nashville, TN.

Planning usually begins by defining and articulating the "Vision" (where you want to be) and "Mission" or "Purpose" (why you need to go there). Once these are decided "Message" is your purposeful approach to integrating and communicating your objectives through everything you build, do and say.

What's the message?

*"Nature is the Model"**

- **Copy Nature** – *not other zoos**
- **Biomorphic** – *look and function is 'natural'*
- **Naturalistic** – *artificial appearance, natural function*
- **Soft Zoo Architecture**** – *earth forms, water features, plantings, mulch, logs, etc.*
- **Hard Zoo Architecture**** – *tile, concrete, steel, glass, etc.*

*David Hancocks **Terry Maple

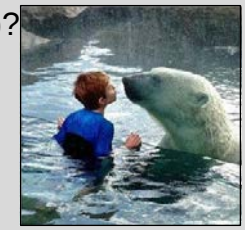
There are many changing development and display styles being pursued in zoos, which can generally be considered among the these categories. Pick the best direction for your unique present and future needs and innovate rather than copy. This applies to both design of built facilities and design of management policies and practices.

What's the message?

*Google online Dictionary
**Merriam Webster Dictionary

Authentic: "Of *undisputed origin, not a copy; genuine"**

- Museum authenticity (original artefacts)?
- Zoo authenticity
  - Realistic simulation
  - Honest representation of what you are doing



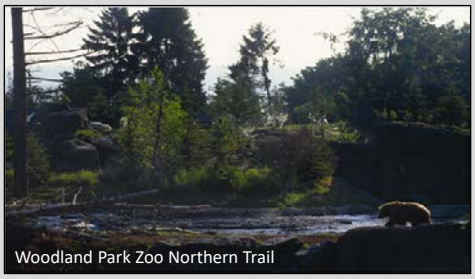
Immersion - Cochrane Polar Bear Habitat, Ontario, Canada

Immersion: *"Absorbing involvement"***

- Immersed in intentional, multisensory environments
- Immersed in discovery & wonder
- Immersive exhibits: to be inside the environment and experience, not to be on the outside looking in.

ZSL has used the terms "Immersive" and "Authentic" to describe your intended design outcomes. I've found these terms to have many different meaning to many different clients. Different areas of the zoos can have distinct characters, provided **each zone is clearly defined** and the intended "storyline" **is completely clear** to visitors and staff. For example, **1)** part of the zoo can be themed as a literal (authentic) demonstration through facility design and operation of "How we give the animals in our care the best possible state of wellbeing. **2)** another zoo area could realistically and immersively simulate one of ZSL's in-situ research camps or an in-situ wildlife orphanage, for example.

Landscape Immersion:

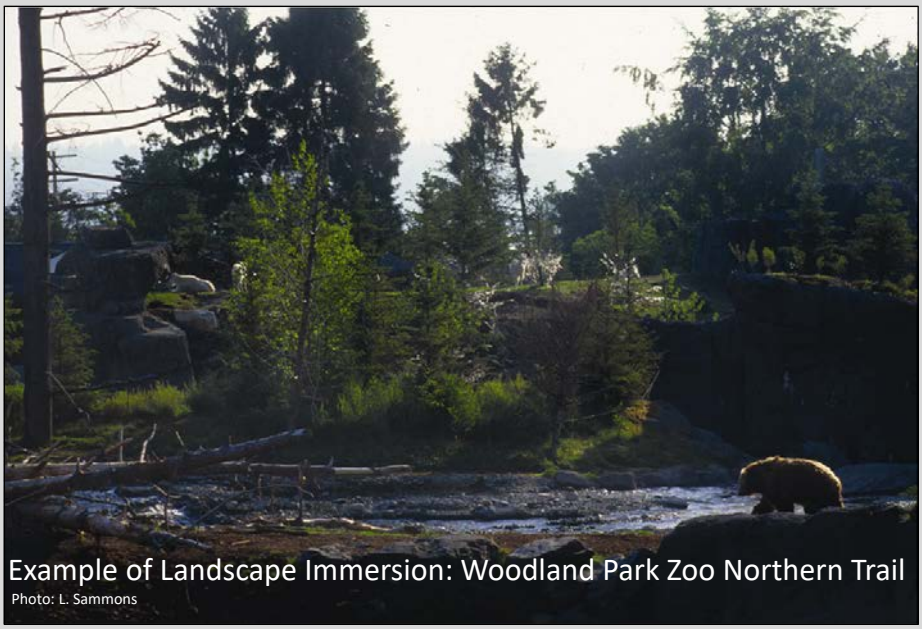

Woodland Park Zoo Northern Trail

Landscape: *an expanse of natural scenery*
Immersion: *absorbing involvement*

- "…the viewer should move through the characteristic landscape of the natural habitat zone seeing its sights and savouring its moods*
- Only then can we become aware that the landscape is also inhabited by animals separated by unseen barriers*

*Woodland Park Zoo Long-Range Plan Jones & Jones 1976

As a founding grandfather of the 'landscape immersion' style of exhibit design beginning in the mid-1970's in the US, the term "immersion" usually means "landscape immersion" to me.

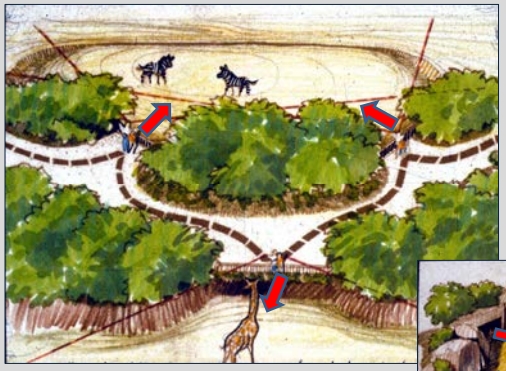


Example of Landscape Immersion: Woodland Park Zoo Northern Trail

Photo: L. Sammons

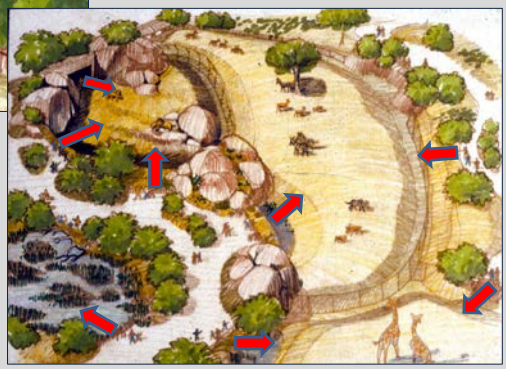
Here you see a broad view of Seattle's Woodland Park Zoo's Northern Trail exhibit I helped to design with my old firm US CLRdesign in 1997. Note the mountain goats in the background. This landscape was entirely created on a previously barren bison paddock, although the large evergreens in the background are outside the zoo and used as "borrowed landscape". This type of exhibit is best suited to your larger Whipsnade property.

Landscape Immersion: How To?



Sightline Design

Allow the visitors to appear to move through the animal areas.



Sequential Experience

Landscape Immersion Concept

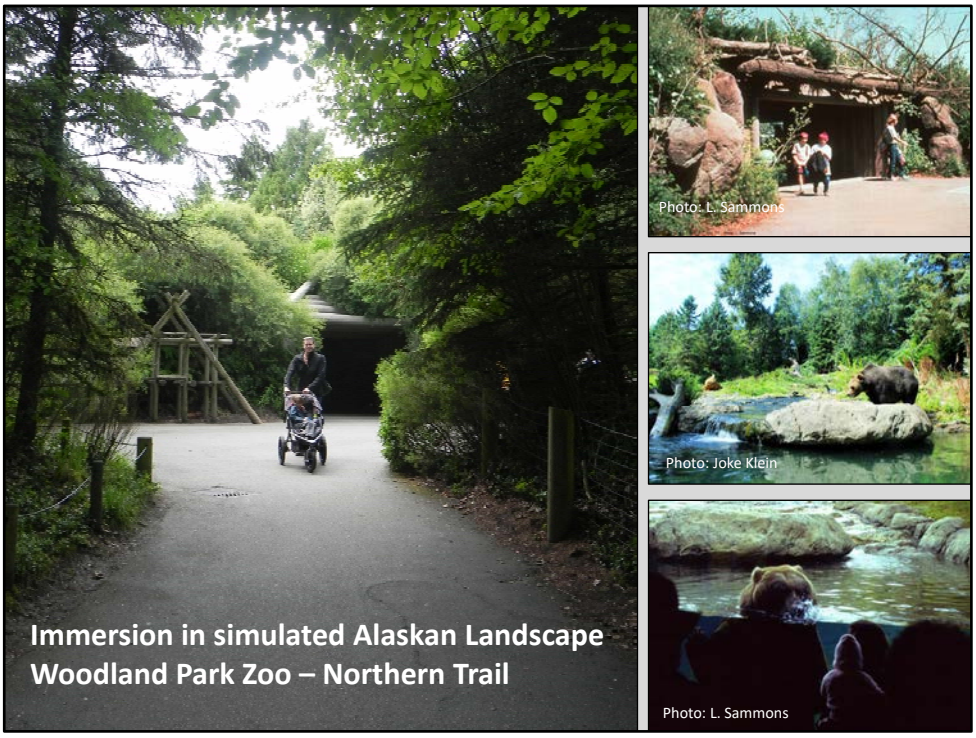
The overall idea is to recreate the feeling of walking with your family or a small group through a national park where the natural landscape dominates and surprising views are sequentially revealed, as in a well written documentary.

See **Coe-Jones Rules for Good Immersion Exhibit Design** for much more detail about landscape immersion design principles.

The success of landscape immersion depends entirely upon two factors:

- Completeness and correctness with which the characteristic landscape is projected ("Authenticity"?).
- Care and accuracy with which the viewpoints and views are located and composed, concealing barriers, enhancing perspectives, composing light and shadow and, most importantly, visually unifying animal space and visitor space".*

*Woodland Park Zoo Long-Range Plan Jones & Jones 1976



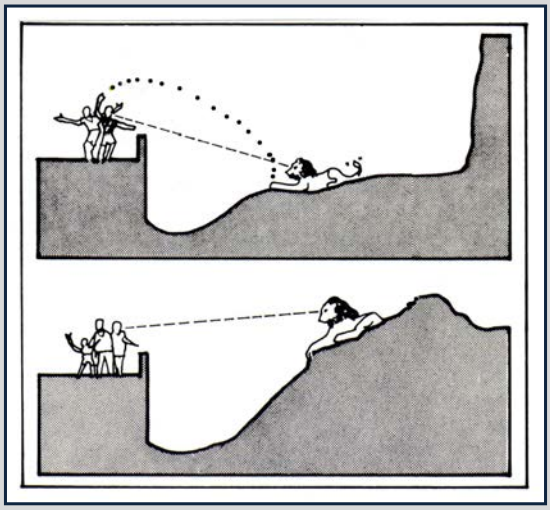
The main photo shows the immersive walkway with the Tundra Interpretive Center hidden behind a living façade of arctic willow (modelled after paleolithic tundra structures) with a salmon drying rack. This photo and the picture in the middle-right are recent, showing the exhibit after 20 years of plant growth. The top and bottom right photos were taken during the first five years after opening in 1998.

Woodland Park Zoo Northern Trail

I took this video in 2012. Note views from a cave separated from a bear in the cave on the other side of the barrier window. Near the end of the video the two bear brothers are shown in a mock fight at the underwater viewing window over who is dominant and gets the preferred place next to the visitors.

What's the Message?

Build Respect



- People looking down on animals want to control them.
- People looking up to animals may respect them more.

In most human cultures the term "to look up to" connotes "respect" and the term "to look down on" means to disrespect. So if we want to **teach respect for nature** we need to present nature (zoo animals) **respectfully above visitors**. Importantly, animals also seem more comfortable and less stressed when above potential threats.

Additional reading: Coe, Jon C., 1985. "Design and Perception: Making the Zoo Experience Real" in Zoo Biology, vol. 4 no. 2 , pp. 197-208.

What's the message?
Affiliative Design

Howdy crate

It is widely understood the certain environmental situations (such as "a line in the sand") encourage aggressive behaviours among social species, while other settings encourage affiliative behaviours. Thus exhibit designs should be developed encouraging affiliative behaviours between animals/animals, animals/staff and animals/visitors. "Howdy crates" resembles a shipping crate assembled on both sides of the viewing window. Children can climb into the crate or sit atop it on one side while young gorillas can enter the crate on their side.
http://www.joncoedesign.com/pub/PDFs/IncreaseAffiliativeBehavior.pdf

2. Design for Wellbeing

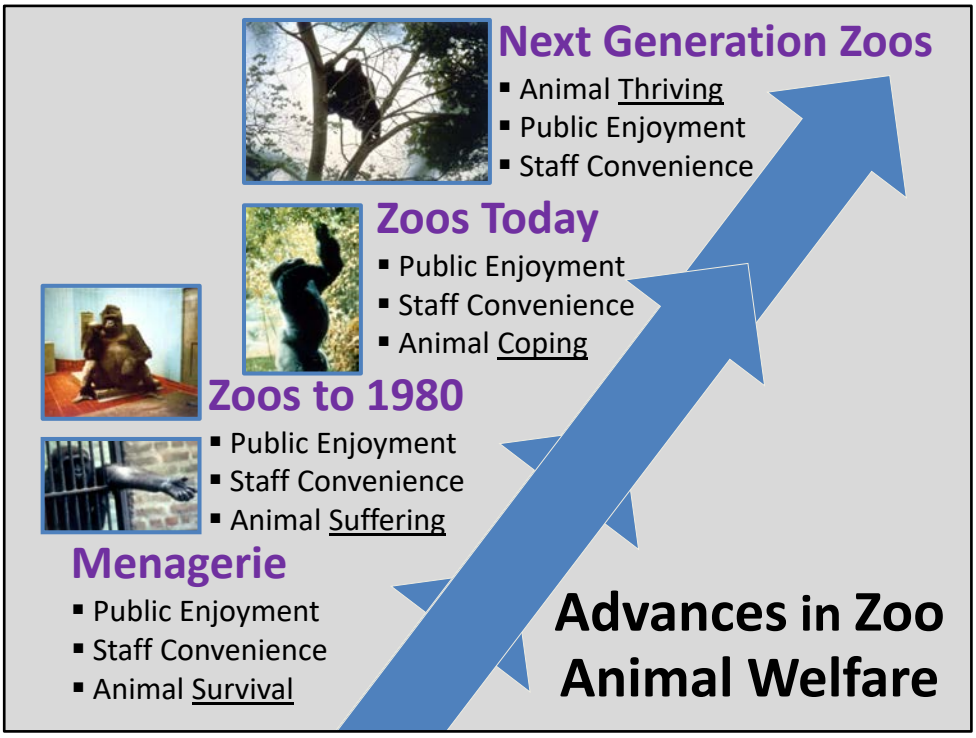
"Insuring the health of wildlife"

"We will demonstrate best practice in wildlife health and welfare in our zoos and conservation breeding programmes [ZSL 200]

Animal Welfare

becomes first among equals in zoo design and management

The last three decades of zoo design have emphasised improvements in the visitor's experience with more attractive and naturalistic exhibit facilities. While some of these improvements also benefited animals' welfare, "enrichment" remained largely remedial. We are now observing a multi-institutional move to make animal welfare, now being discussed in terms of general "wellness and well-being", the leading motivation for design. Thought leaders like Terry Maple are advocating **"wellness by design".**



Evolutionary trajectory of animal welfare in zoos.

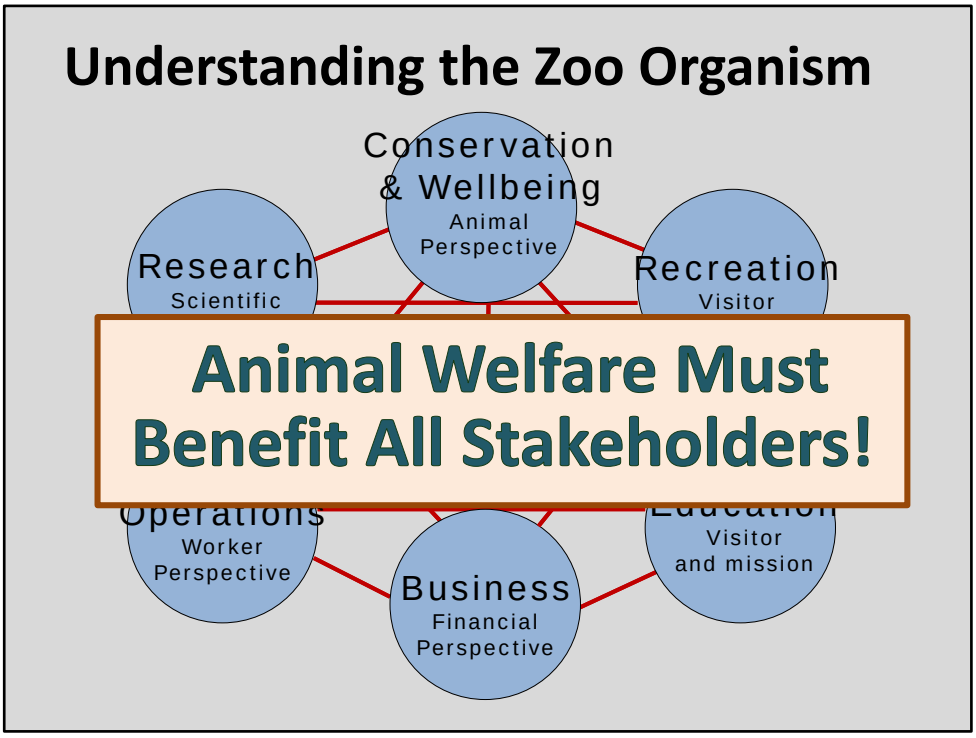
Benefit All Stakeholders!

Lance Miller Director of Animal Welfare Research at the Brookfield Zoo

There are three main reasons why zoos should focus on animal welfare:

- First: we have an ethical responsibility to take the highest care of our animals.
- Second: it benefits conservation. The link between conservation and reproduction can ensure we have animals for future generations of zoo visitors to observe.
- Third: visitors want to see animals engaged in a diversity of natural behaviours. They want to see active animals. Animal welfare is not only good for the animals but, when visitors see active animals, they have a better experience and want to become more involved in conservation.

While the move to improve animal well-being is largely driven by animal welfare advocates, we must always consider the broader picture and insure we simultaneously improve the well-being of all stakeholders. We must discourage the view that there is a competition for resources between zoo animals and zoo visitors and seek solutions benefiting all, including caregivers and the commercial enterprise!



Most zoo associations still declare zoos have four objectives: recreation, education, research and conservation. But actually there are six when you consider zoo operations and business, and all are valid and necessary. The best zoos are those that fully integrate all operations, using synergies to multiply results. Integration is also essential to team building and minimizing competition for resources among departments. This certainly applies to improvements in welfare.

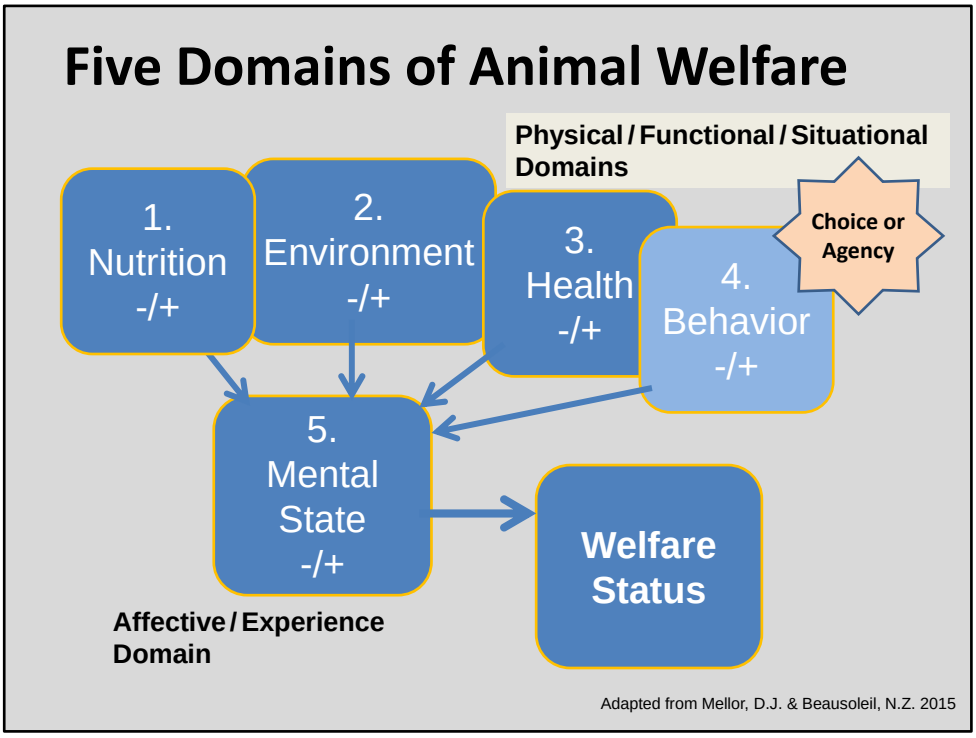
Zoos are criticised for keeping animals in captivity and depriving them of "freedom". As Hediger (1950) writes on page 4, "…the free animal does not live in freedom, neither in space or as regards its behaviour towards other animals." None of us are entirely free of obligations and limitations. "Freedom" is thus relative. I believe the organism with the greatest degree of choice and control has the greatest degree of relative freedom. This is the basis of the move to provide zoo, research and sanctuary animals the greatest practical degree of choice and control in managing their own lives. See: http://www.joncoedesign.com/pub/PDFs/EmbedEnrichmentDesigners2017Wroclaw.pdf

New Five Freedoms...to:

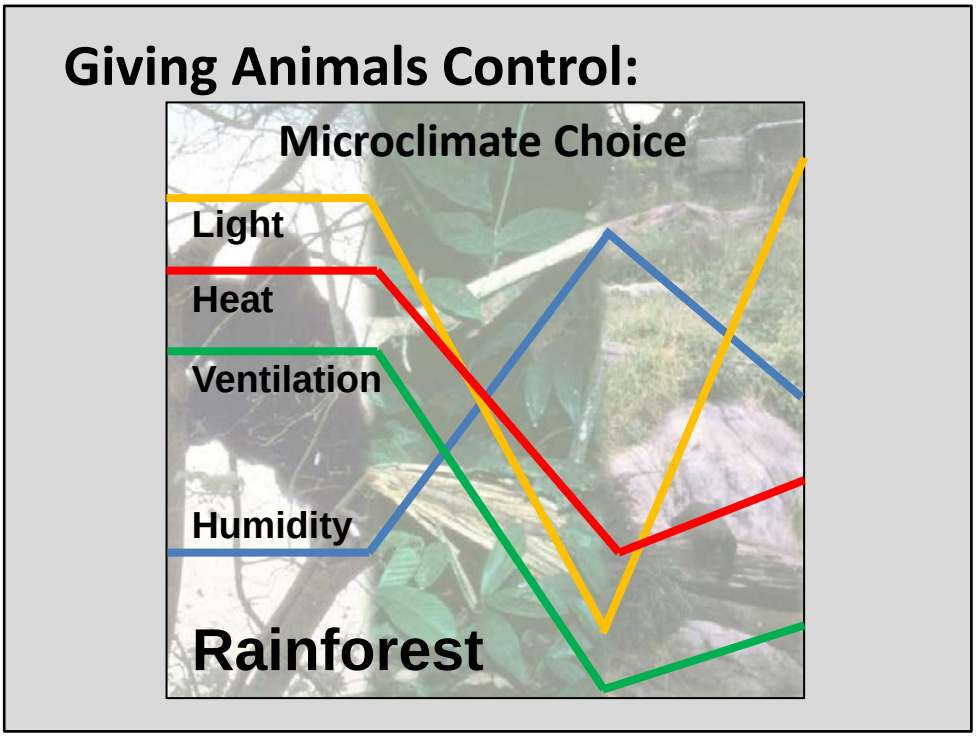
- **Achieve Competence:** *"Effective performance of normal functions"*
- **Have Choice:** *"The right or ability to choose."*
- **Take Control:** *"The power to influence...the course of events"*
- **Experience Challenge** *"To arouse or stimulate, especially by presenting with difficulties"*
- **Engage Complexity:** *"The quality of being intricate or complex"*

The 5 C's

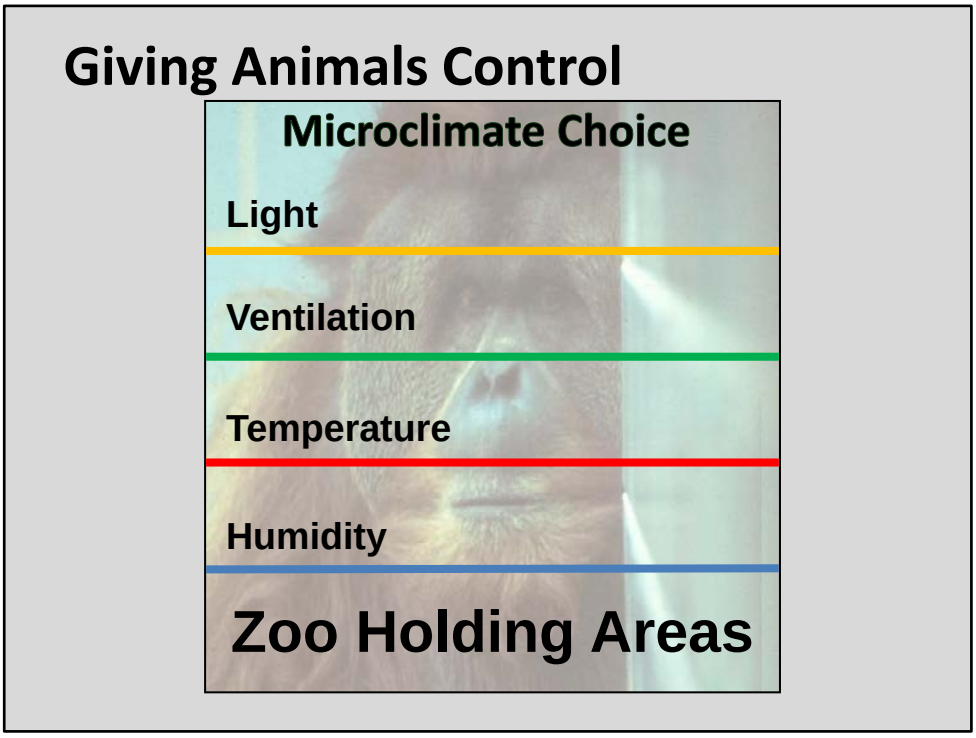
This is my approach to replacing the old "Five Freedoms" ("freedom from…") model for measuring animal welfare to a more positive and proactive "freedom to…" approach.
http://www.joncoedesign.com/pub/PDFs/EmbedEnrichmentDesigners2017Wroclaw.pdf



There is a growing movement among zoo animal welfare advocates to accept the "Five Domains" model (Mellor, D.J. & Beausoleil, N.Z. 2015) to replace the old "Five Freedoms" model for measuring animal welfare. While a useful tool for organizing welfare evaluations, a more proactive approach like the "Five new freedoms" has more appeal to me.



Animals move through gradients of ambient microclimate in natural environments to meet their needs.



Most indoor animal areas have uniform microclimates providing animals no choices or control. It should not be this way. Simple motion sensors can allow animals to activate heaters, fans or other microclimate controls when animals sit in selected areas. http://www.joncoedesign.com/pub/PDFs/ChimpanzeeChoices1998.pdf . RFID smart gates (refer to slides 54, 55) will allow individualized feeding opportunities (as are widely available in modern dairy and feed lot facilities). Advances in micro technology and bundling capabilities will allow animals far greater choice and control over their activities while also effortlessly registering data points for remote research data bases, updating digital signage for guests and sending WI FI alerts to ap using visitors showing where rotating animal are presently located, as well as information about the animals.

Moving Enrichment Features
Physical fitness

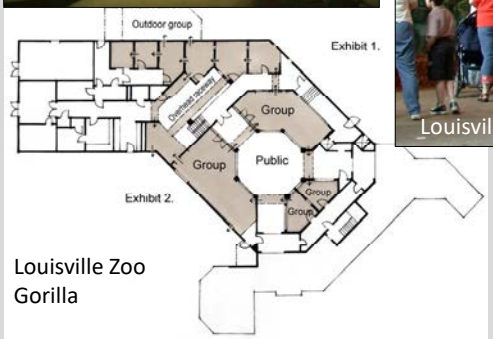
Leopard Swing - National Zoo of South Africa

Physical fitness is a key feature of well-being. This video shows a fit and well coordinated leopard who must earn every bite of his diet through physical exertion, as it would in the wild. It took months of this typical zoo leopard to gain the balance and strength to achieve the level of fitness demonstrated in this video. This type of balance apparatus can be designed to be more natural looking, as the next slide shows.

Moving Enrichment Features

Here is an example of how moving enrichment features can be easily made from simple natural materials.

Enrichment and choice 24/7/365



Louisville Zoo
Gorilla

Having access to enriching opportunities and choices at all times, 24/7/365 and life long, is a major new focus of zoo animal wellness planning. These are example of great ape facilities where the apes have free access to multiple areas whenever they wish.

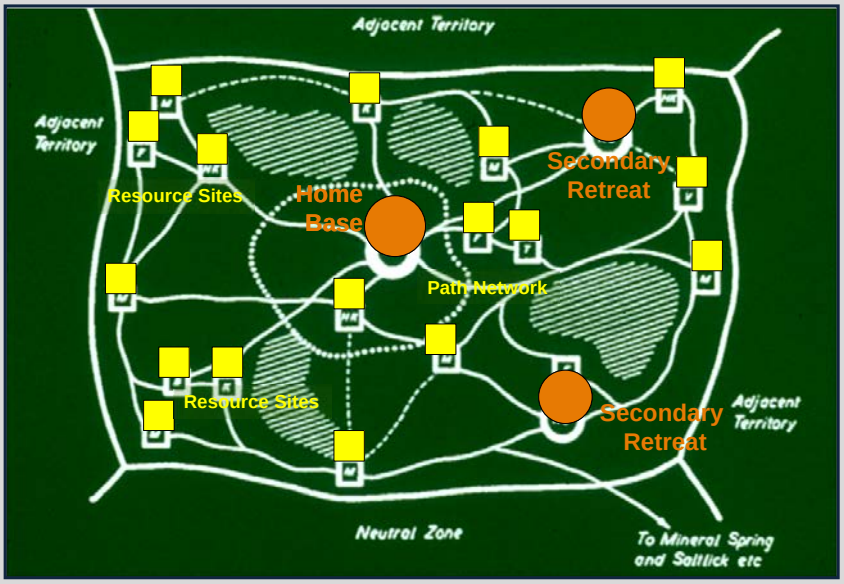
3. Mixed Species Rotation, Animal Trails and "A Walk in the Park"

"Amazing Experiences of wildlife in our zoos"
[ZSL 200]

DEFINITION "Animal rotation" is an integrated management and facility design strategy which allows animals to move between two or more interconnected display and off-display areas for the purpose of increasing available space and behavioral opportunities for the animals. Coe, J. Mixed Species Rotation Exhibits 2004

Why must most zoo animals spend their entire lives limited to one area? Why can't they take themselves for a walk, or time-share with their neighbours' enclosures? Rotation exhibits are like traditional mixed-species exhibits, but the animals use the areas consecutively rather than concurrently.

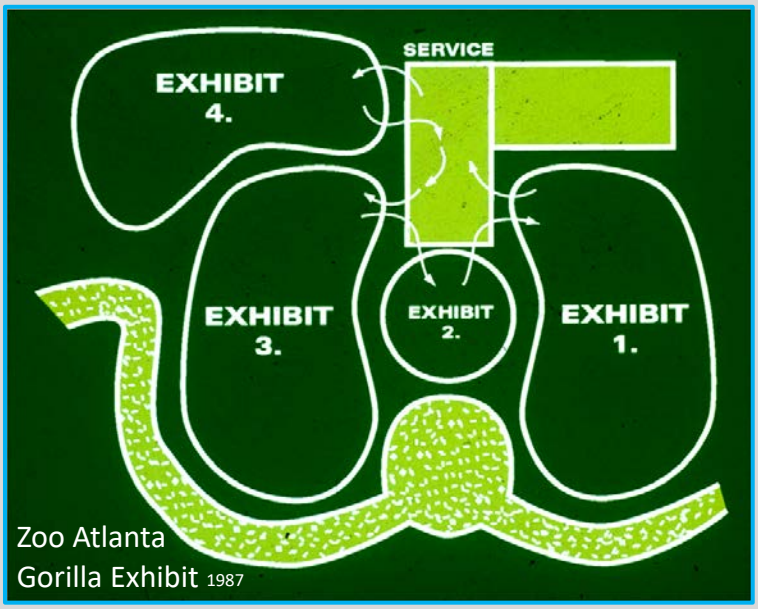
Back to Nature – Animal territories



Nature is the Model: Hediger's Concept of Territory

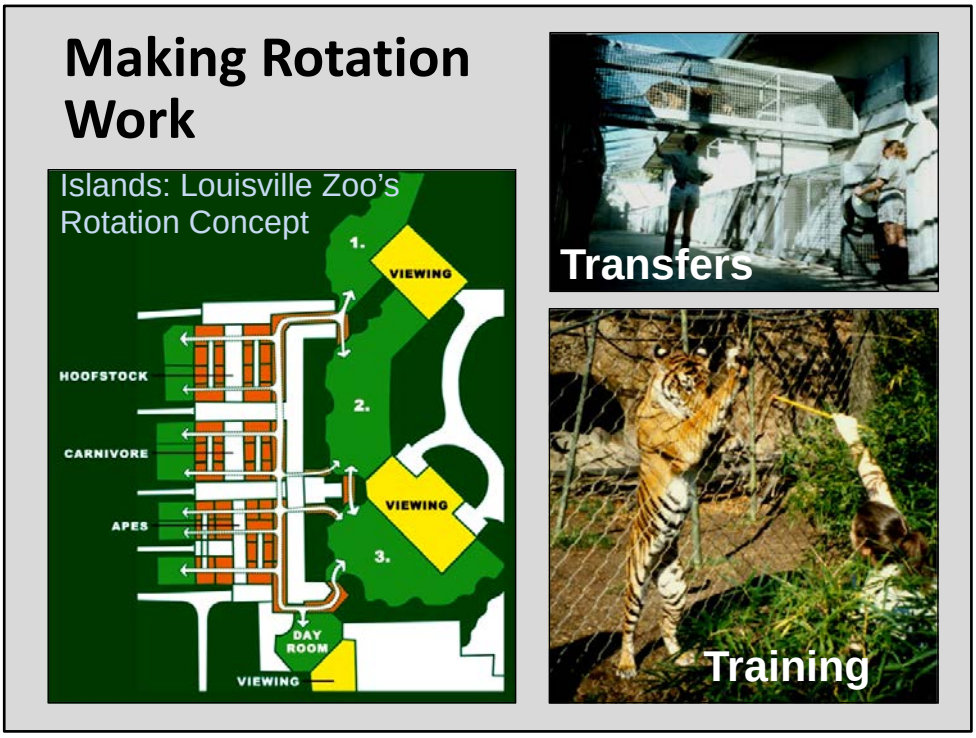
Dr. Heini Hediger published this sketch of a typical wild animal's territory (or home range) on *Figure 5*, page 14 of *Wild Animals in Captivity* (1950). He pointed out that animal territories are not homogeneous spaces, but rather are highly differentiated into specific resource use areas connected by highly defined and habitually used circulation networks. [English version: Hediger, H. Wild Animals In Captivity, p 14. Dover Publications NY 1964] On page 17 he goes on to describe how multiple species have overlapping territories, often using the same trails, but at different time. To me this exemplifies different individuals and species 'rotating' or alternating use of these areas and trails. Why can't zoos also be organised around time sharing and trail networks? What could be more natural? We must understand and recreate such systems in zoos.

Zoo Animal Rotation



The first major zoo exhibit I know of designed to rotate a single species was the Ford African Rainforest Gorilla Exhibit at Zoo Atlanta I helped to design with Dr Terry Maple and my old firm CLRdesign. It opened in 1987. http://www.joncoedesign.com/zoo/zat_gorilla.htm . Four gorilla troops were intended to rotate through four different outdoor exhibits, perhaps on a weekly basis, modelled on George Schaller's and Dian Fosse's description of territory overlap and encounters in mountain gorillas. However, for the first 16 years zoo staff did not attempt this built-in rotation or alternation enrichment system. However in 2003 Kristin Lukas did test the rotation concept as a research project and found it beneficial to the gorillas. https://www.researchgate.net/publication/248336018_Gorilla_behavior_in_response_to_systematic_alternation_between_zoo_enclosures . The zoo then abandoned gorilla troop rotation after the conclusion of this research project and gorilla troop behaviour returned to previous norms. In about 2009 Zoo Atlanta staff under new leadership reinstated the full troop rotation concept with positive results (Jodi Carrigan, Zoo Atlanta Assistant Curator of Primates personal communication, 2019)

The first zoo I know of to introduce the concept of multi-species rotation was Louisville Zoo in Kentucky, in 1995. Their Islands exhibit included rotation of orangutans, gibbons, babirusa pigs, Malayan tapirs and Sumatran tigers on a randomized schedule. The storyline concept was to recreate the possible movement of animals around a jungle fig tree in fruit in Southeast Asia. A three year evaluation showed the rotation was environmentally enriching and one previously unseen behaviour was the female tapir scent marking over the tigers scent mark. (White, B., et al. 2003. Activity-based exhibition of five mammalian species: evaluation of behavioral changes. *Zoo Biology* 22(3): 269-285.). Stress from having predator species nearby was not a negative factor for potential prey species in this case.



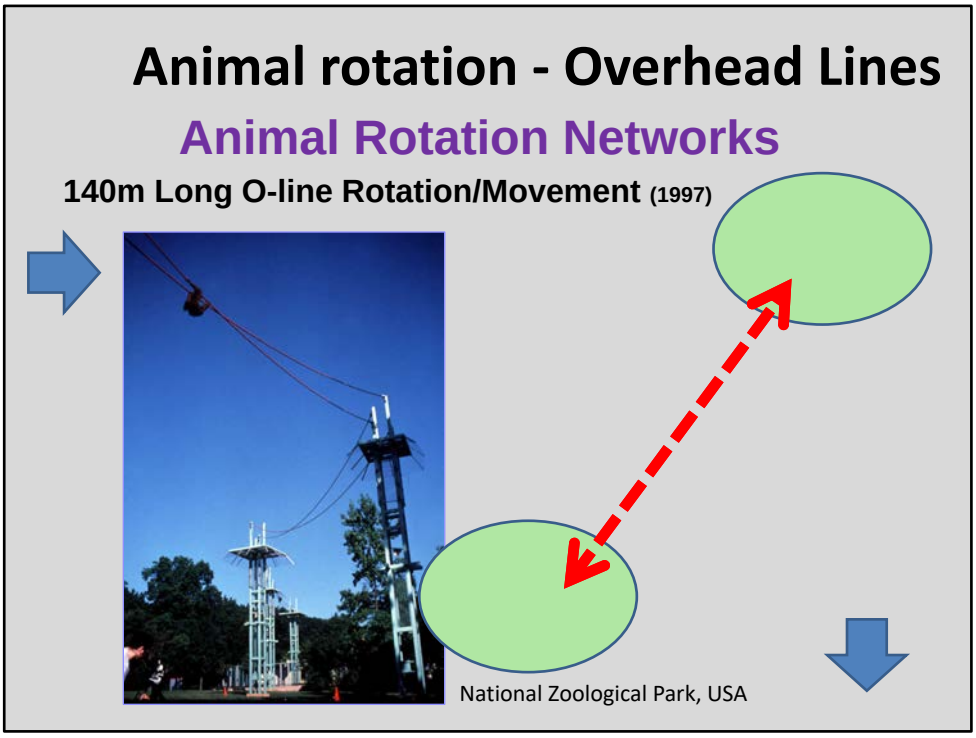
Based on this natural situation and working with my old firm CLRdesign, we developed this plan with three outdoor and one indoor connected display areas. Using an extensive by-pass raceway system and positive reinforcement training, the **animals are rotated at random times and sequences**, with each care giver being "head keeper for the day". Ms Jane Anne Franklin, Mammal Curator/ Supervisor of Animal Training, Louisville Zoo (Jane.Franklin@louisvilleky.gov) believes that by 'making it new every day", they avoid the kinds of accidents occurring when operations are too repetitious.

Staff and animal training for reliable movements through gates and for recalls is essential for animal rotation. Other critical factors are: **1)** all barriers must be adequate for the most robust species using the area and **2)** all animals must be free of contagious diseases.

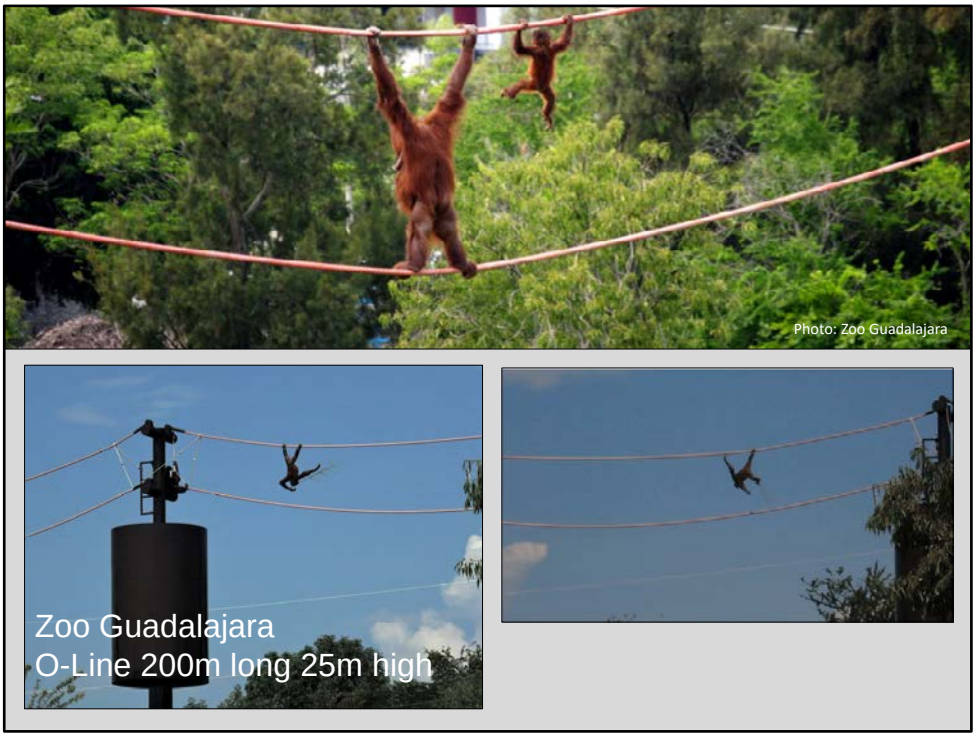
Training is essential to rotation

Tiger Management Louisville Zoo

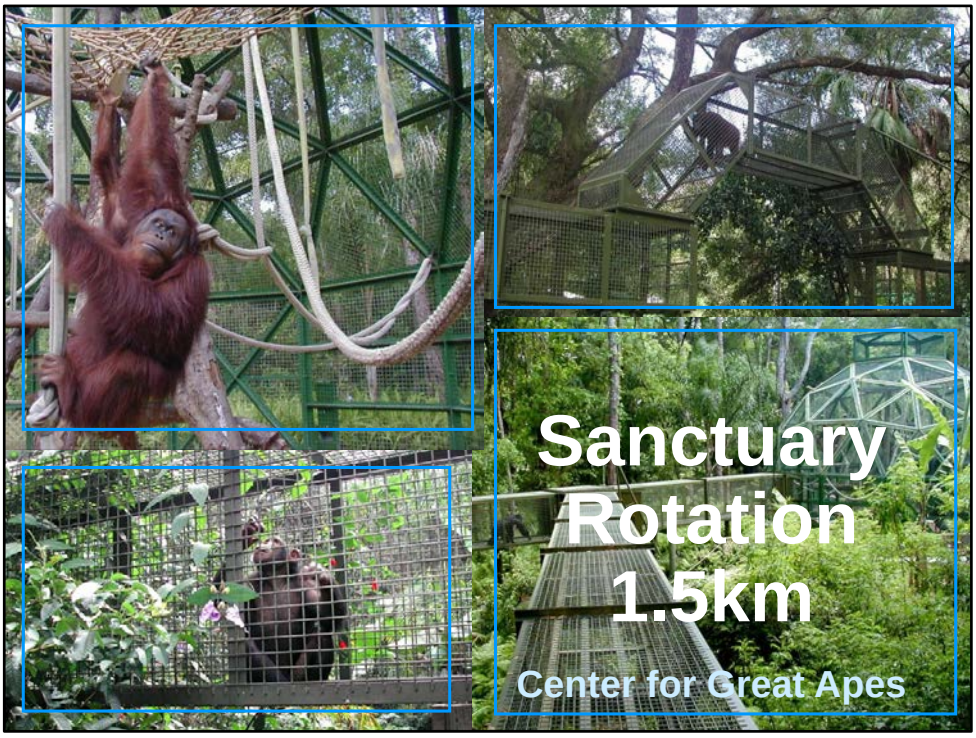
This video show a well-trained Sumatran tiger at the Louisville Zoo Islands exhibit responding to “recall” and “gate” directions by staff.



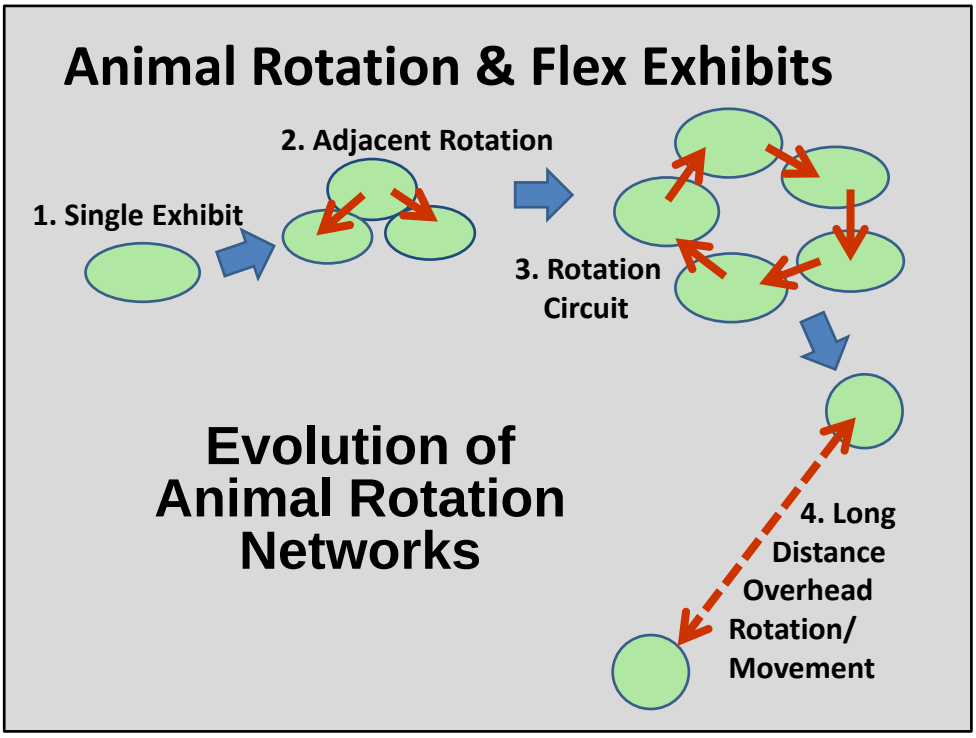
Long distance overhead trails were first invented by Dr Ben Beck with the U. S. National Zoo's "O" Line" in 1997. It allowed orang-utan's to transit 16 metres above visitors for about 140 metres between their old Great Ape House and then new "Think Tank" (Boda-Bahm, C. 1997. "Think Tank Evolution and Revolution" in *Museum News*, pp. 44-48). One orangutan succeeded in climbing down from a structure, but there have been no escapes since than and I know of no cases of an orangutan dropping or falling from an O-line. Other O-lines have been developed at Indianapolis Zoo in the USA, Zoo Guadalajara in Mexico and at Tama Zoo in Tokyo and four other zoos in Japan.



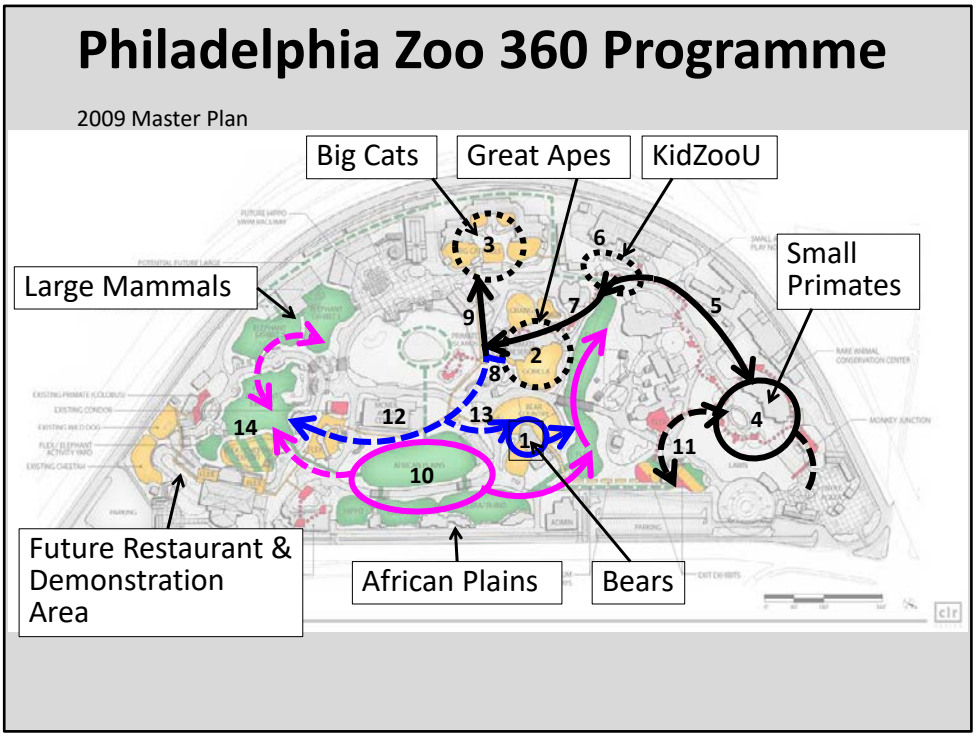
I helped Zoo Guadalajara in Mexico develop an O-line concept for themselves which they opened in 2014. It is presently about 200m long and they plan to extend it at least twice as far. This design is an improvement on the NZP facility because it does not require electrified wires and enables staff to raise browse branches up to the orangutans on their towers. O-line towers should also provide shade for the apes. O-lines are examples of facilities which do not look at all natural, but do provide naturalistic opportunities for challenge, exercise and high level viewing and are dramatic sights for visitors.



While small raceways had been used as exhibits for wild cats and other small mammals at the Highland Wildlife Park in Scotland previously, the Center for Great Apes in Wauchula Florida, USA, http://www.centerforgreatapes.org/ was first to develop an extensive raceway system as an enrichment policy beginning after my suggestion there in 2000. Since this is a privately owned sanctuary for chimpanzees and orangutans rescued from the entertainment industry and not a public zoo, no attempt was made to beautify the functional raceways. When discussing the practicality of such raceway trails I always recommend interested parties visit Ms Patti Ragan, owner operator, for themselves to see how well this system works to improve animal wellbeing.

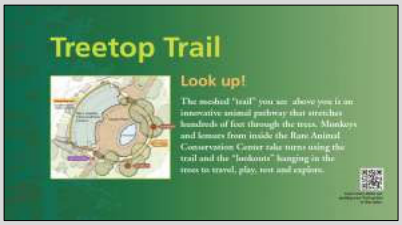


1. **Single Exhibit:** In this typical condition an animal spends its entire life in a very limited area. Even with good design and management, including environmental enrichment, there are very limited opportunities for exercise or exploration.
2. **Adjacent Rotation:** Occasionally a zoo connects adjacent exhibits allowing a few animals to alternate or to use time sharing. For example a few zoos allow hyenas access to lion displays during the night.
3. **Rotation Circuit:** In 1996 I worked with Louisville Zoo and CLRdesign to develop a four exhibit/five species rotation "Islands" exhibit complex (slides 30-32). The zoo followed this with further major rotation exhibits in their "Gorilla Forest" and "Glacier Run" projects. The diagram shows "through exhibit rotation". However the Louisville exhibits use the alternative "by-pass" raceway system which allows animals move past occupied exhibits and adds greater operational flexibility (see previous slide 31).



This 2009 Philadelphia Zoo master plan I helped to develop with CLRdesign shows the long-term intention to interconnect the entire zoo through multi-species overhead and on-grade trail systems, both as ways of moving animals frequently to different areas and as enrichment, exercise and display systems in themselves. The lines shown in black have been completed. Research fellow Ms Marieke Gartner has completed some evaluation, finding that most primates and big cats prefer to use the trail system over either indoor or outdoor existing exhibit areas the majority of the time, when given the opportunity.

Tree-Top Trail Species Using Phase One



Images: Philadelphia Zoo

These are the species who used the first phase of the overhead Tree-top Trail. Other species such as black & white ruffed and sifaka lemurs have been added.

Philly Zoo 360

Treetop Trail – 500m Long Across the Zoo

Video: Philadelphia Zoo

This video from the Philadelphia Zoo shows the mangabey "Storm" confidently taking himself for a walk along their Tree Top Trail. At present a 1km round trip is possible and the system is planned to be extended. Consider the benefits to their troop of tiny pygmy marmosets who make this one kilometre round trip! 12 species of small to medium sized primates now use the trail. Some zoo professional are not in favour of these trails, saying "They look too artificial and unnatural". But seeing the primates' body language and confidence confirms the animals' find its use quite natural. Philly Zoo acknowledges this lengthy trail system does require more caretaker time than the traditional exhibits, which remain in use. This is a supplemental system required to increase animal well being.

Online videos at: https://www.youtube.com/watch?v=aLg-wupmE54

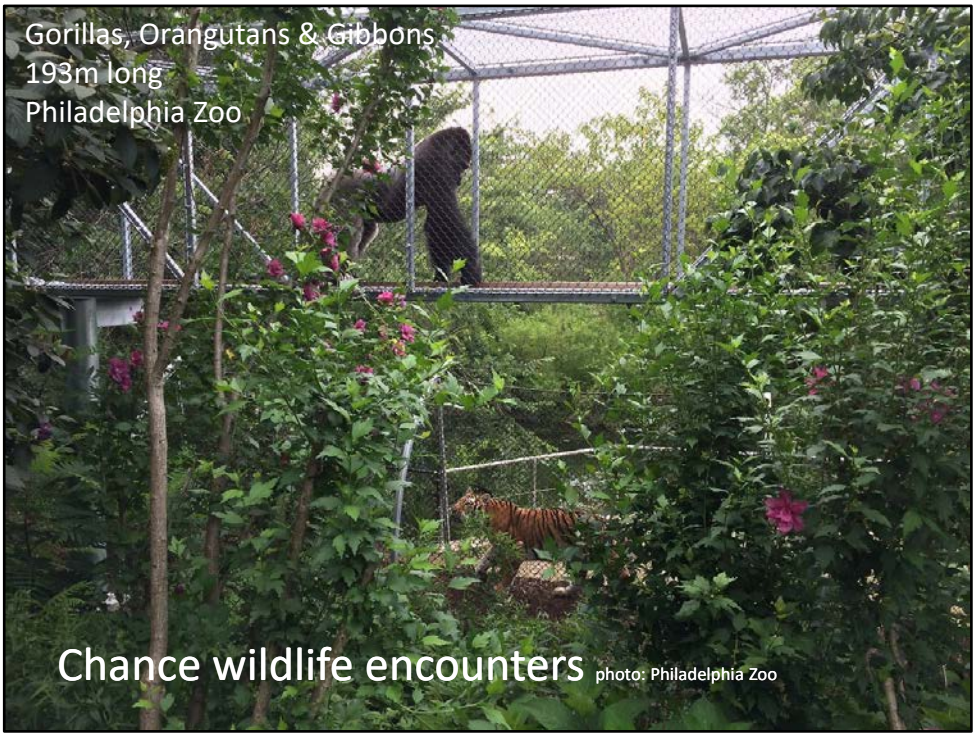
The smaller primate Tree Top Trail (500m long) includes a number of cut-off gates as well as several off-line activity pods where primates find food, water, shade and changing enrichment features. These are generally built around large existing trees. Animals can be moved into these areas to allow other animals to by-pass them. Pedestrian gateways below animal trail crossings prevent animal wastes from dropping onto guests.

Following the success of the Philly Zoo 360 plan, I introduced the idea of overhead trails and O-lines to Zoo Guadalajara in 2013. The next year they opened their own home-made version of overhead trails, many simply hung from large existing trees. These are alternately used by ring-tailed lemurs and squirrel monkeys.

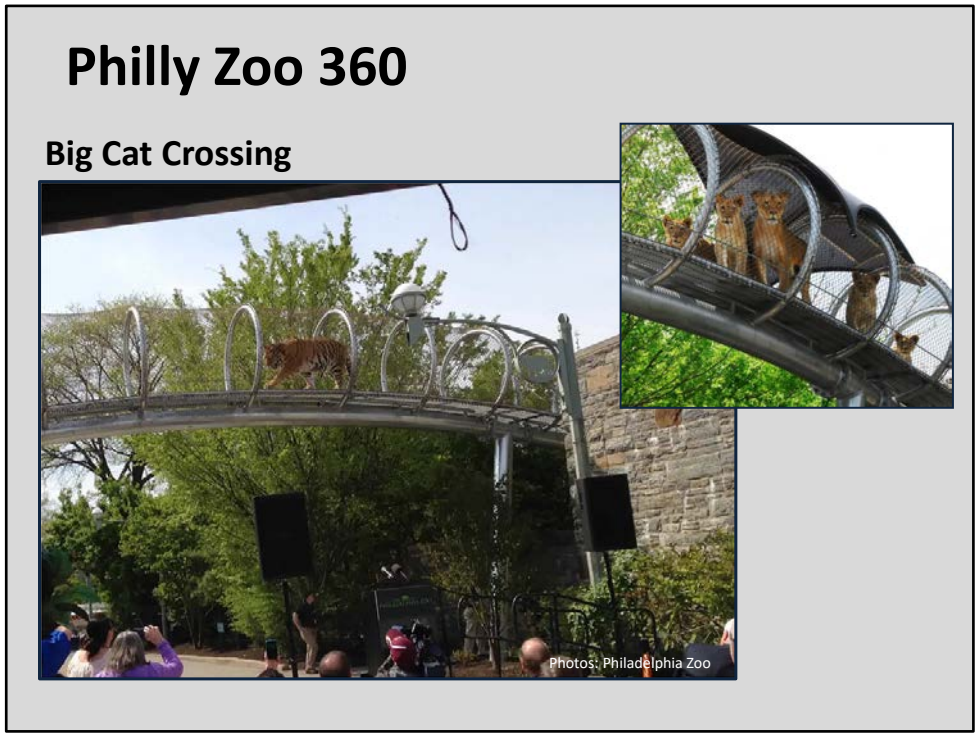
Philadelphia zoo expanded their Zoo360 program over the years to include the 193m long Great Ape Trail used alternately by orangutans, gibbons and gorillas. The somewhat boxy design developed by the local structural engineer was considerably improved by a different engineer for the Big Cat Trail (refer to slide 45).

Gorilla Trail 85m long

This video shows a gorilla comfortably using the Great Ape trail. Research showed different gorillas had varied preferences for walking surfaces.

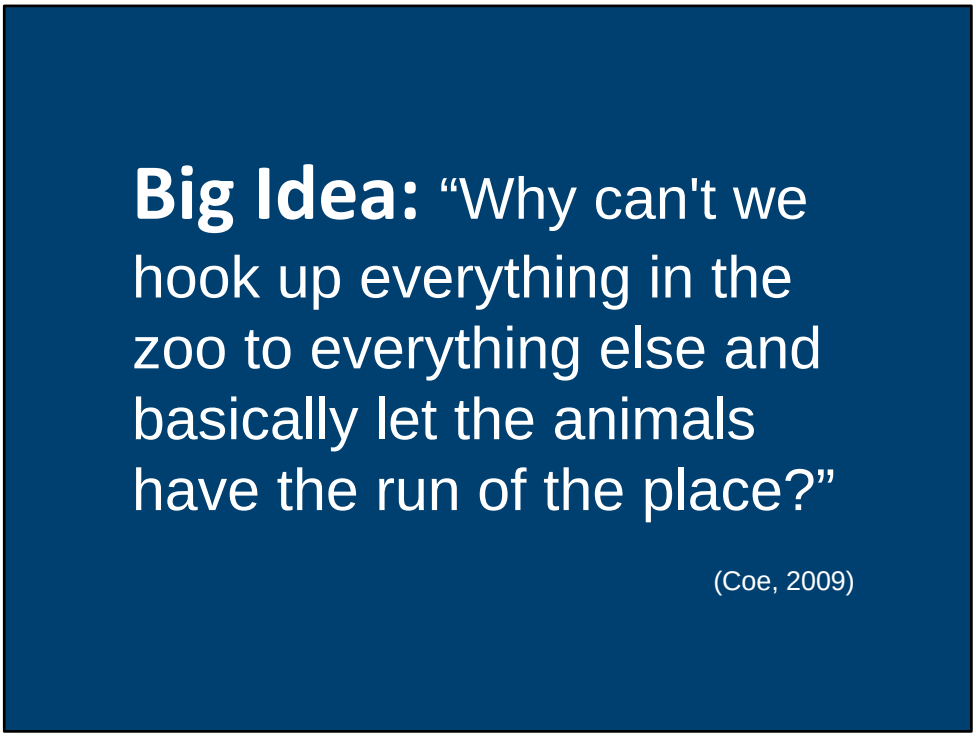


The Great Ape Trail remains elevated while much of the Big Cat Trail is below at ground level and using the same general area. Thus all of the great apes and big cats become somewhat familiar to each other. I'm told that no extreme reactions have been observed.



The **Philadelphia Zoo 360 Transformation Plan** ("As you move around the zoo, the zoo moves around you") is well under way. It also features 500m light weight **"tree top trail"** for primates (slides 27, 38-40), 193 m **Great Ape Trail** for gorillas, orangutans and gibbons (slides 42-44). There also is a 78m **Big Cat Trail** which connects to an extensive raceway and exhibit rotation system in the big cat area. This image of the tiger using the overpass has gone viral on the web, creating the unrealistic expectation among some visitors they will always see the tiger above them on the overpass. Actually it only takes the big cats a few seconds to cross. Species alternately using Big Cat Trail include Bengal tiger, African lion, jaguar, snow leopard, Amur leopard and cougar. Note this design is considerably more elegant than that developed previously for the Great Ape Trail.

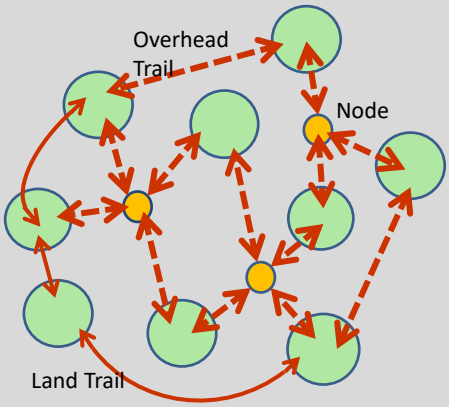
See online at: https://www.youtube.com/watch?v=Zq4HjpoHxkk



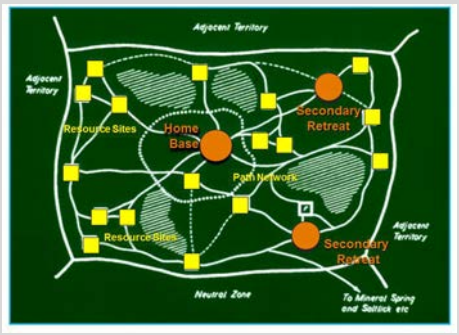
Original big idea for **Philly Zoo 360** development.

Outside the Box

Animal Rotation Networks



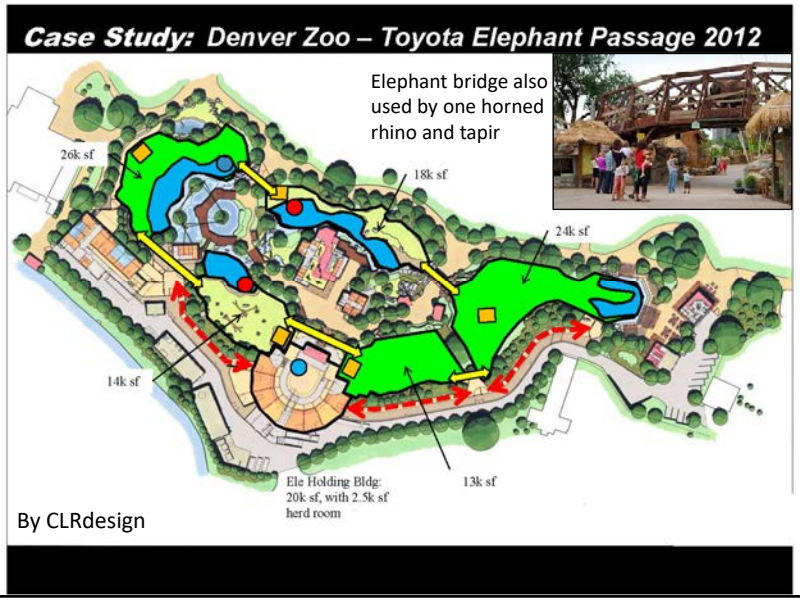
Animal Trail Network
Zoo Wide Concept



Nature is the Model
Hediger's Concept of Territory

Now compare the idea of a zoo wide animal trail network to Dr. Hediger's diagram of a natural territory or home range and note similarities.

Large Animal Rotation



Denver Zoo's Toyota Elephant Passage, is a large animal rotation exhibit which I helped conceptualize, but as later designed by my old firm CLRdesign, opening in 2012. Asian elephants, one-horned rhinos and Malayan tapirs rotate through five areas around the circuit, crossing over the iconic elephant bridge (graphic by CLRdesign).

Mixed Species Elephant Exhibits

Dallas Zoo Giants of the Savanna 10 elephants in 4ha – 0.4 ha per elephant

Photo: *Google Earth*
By CLRdesign

Dallas Zoo open a large African Plains exhibit with an elephant zone, a mixed-species hoofstock zone and an intermediate zone where all of these species mix as a variation on the rotation or alteration concept. Boris Zoo in Sweden was the first to test this concept in 1962 and several other North American zoos including the Fresno Chaffee Zoo and the Kansas City Zoo have developed versions of this concept.

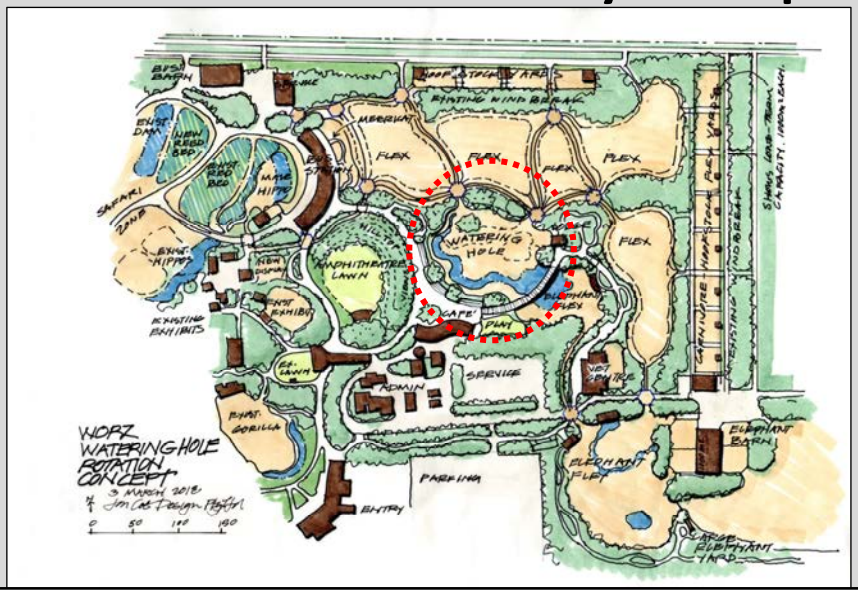
Mixed Species Elephant Exhibits

Dallas Zoo Giants of the Savanna *(Photos from zoo website)*

By CLRdesign

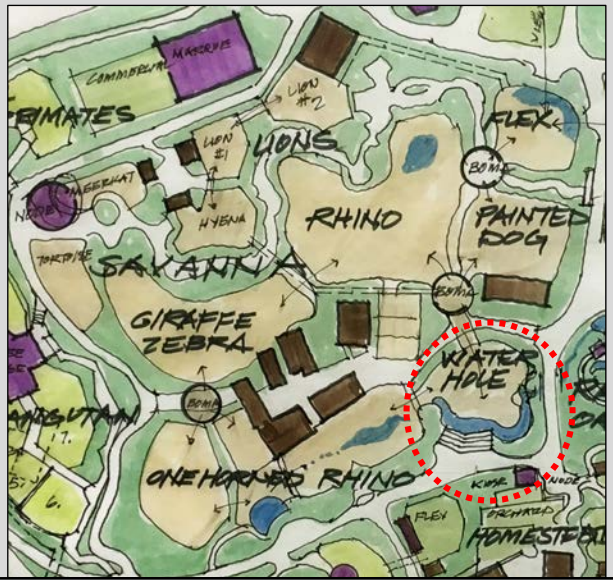
Dallas Zoo's mixed-species exhibit.

Werribee Open Range Zoo
Waterhole exhibit – Early concept



Simulated waterhole exhibits, mimicking African safari experiences overlooking animals coming to natural waterholes, are being considered by three Australian zoos, Werribee Open Range Zoo in Victoria, Perth Zoo in Western Australia and Western Plains Zoo in New South Whales. This is an early version of a waterhole rotation concept I developed for the Werribee Open Range Zoo. Please note the concept is being further developed by others and is now considerably modified, though with the same elements. Hoofstock such as oryx and zebra would rotate (alternate with) with carnivores such as African wild dogs and cheetah. Each animal or group would eventually come down to the simulated waterhole where a periodic narration would be presented to visitors. This plan shows hippos and elephants as a part of the rotation, but these ideas have been deletes as impractical in budget terms.

Perth Zoo Concept Plan
African Hoofstock Rotation



This concept plan I developed for Perth Zoo in 2018 as a part of the long-rang plan they are developing shows how their existing African Savanna exhibit of white rhinos, zebras, ostriches and giraffes could be expanded into the area being vacated by their elephants, which eventually will be moved to another facility with much larger elephant facilities. The elephant demonstration yard would be converted to a waterhole exhibit. They are considering whether to acquire one-horned rhinos to replace the elephants and be a part of this rotation or to use the additional space to increase their present hoofstock populations. Additional fencing would be required to add cheetah and African hunting dog to this rotation, which is not being considered at present.

At present, all zoo animal rotation programs require animal care staff to control rotation schedules and animal trail use. How can we provide the animals themselves the choice and control to decide when and where they want to go? Perhaps RFID implanted microchips communicating with programable “smart gates” (widely used in commercial stock yards) will be the answer. For example, on Monday the gates could be programmed to allow the mangabey to go when and where it wishes and the colobus monkeys to go anywhere except where the mangabey is and so forth for all the rotation monkey species. Then on Tuesday a different order is programmed so that access varies somewhat as it would in nature, but each species would have far greater choice and control that they have a present.

Giving Animals Control

RFID Smart Gate

Dr Julia Hoy

Video by Hidden Vale Wildlife Centre

This video demonstrates a test of a “Smart-Pet door” based upon the research of Dr Julia Hoy and associates at the University of Queensland and later commercially developed in UK https://forwardthinkinghome.com/smart-pet-door/ . The University of Queensland Hidden Vale Wildlife Research Centre is testing smart gates for provisioning native animals for release and rewilding initiatives in Australia. hiddenvalewildlife.uq.edu.au . These same simple technologies could be adapted to give zoo animals more choice and control over their activities.

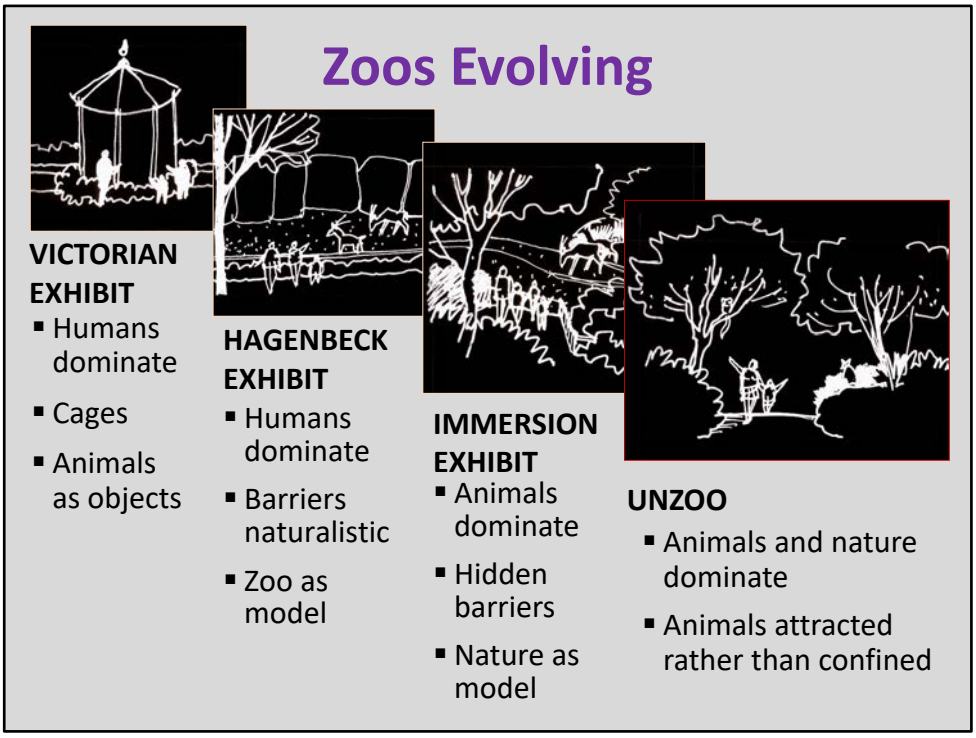
Dr Sarah Webber (s.webber@unimelb.edu.au) of the Microsoft Research Centre for Social Natural User Interfaces, School of Computing and Information Systems, University of Melbourne and colleagues, working with Melbourne Zoo staff, developed this prototype computer projection interactive device allowing orangutans to generate amazing coloured light patterns and even to collaborate with visitors in these activities. This is an excellent example of providing zoo animals with challenging and rewarding opportunities their wild compatriots would never encounter. Yet such activities engage their natural curiosity and creativity, presumably building mental capacity. And visitors seem to enjoy observing and, ideally, interacting through such IT interfaces as well. (Photo: School of Computing and Information Systems, University of Melbourne)

4. The "Un-Zoo" Alternative" & "Third Generation Conservation"

"Fostering sustainable relationships between people and wildlife [ZSL 200]

We are the masters; they…the possessed. Create a place where all residents share the land. Create a place where the viewer is not the owner but a humble guest. Remind people that we are all connected and that wild places have spiritual and emotional wealth beyond dollar value.

Make this your mission!" Ray Mendez, 1999



The **UNZOO alternative** is an aspiration work in progress. At present all zoos require **captivity and coercion** to manage animals. But recent advances in training and enrichment have shown how animals and caregivers can develop a mutually beneficial, collaborative relationship, to greatly reduce and in some cases eliminate the need for coercion or physical containment. This approach also suggests recruiting free-ranging native species for managed and positive interaction with zoo staffs and visitors. The goal is to demonstrate proper sustainable management of urban and rural wildlife and to begin development of a public consciousness of wildlife without arbitrary boundaries or boarders. While this unzoo approach may be quite easy to implement with small native species such as turtles, squirrels and bluebirds, it my not ever be practical with tigers and polar bears.

5. Genetic vs Physical, behavioural and social competence of zoo animals

"Insuring the health of wildlife"

"We will demonstrate best practice in wildlife health and welfare in our zoos and conservation breeding programmes [ZSL200]

ZIMS Species 360 and related international genetic management systems for zoo animals aim to prevent excessive inbreeding for two hundred generations and thus manage optimum **genetic competence**. As of 2016, the organization serves more than 1,000 zoos, aquariums and zoological associations in 90 countries worldwide (Wikipedia). Yet what is the value of a genetically competent zoo animal if, in spite of excellent dietary and veterinary care, it is completely lacking in physical, behavioural and social fitness? What if it shows no initiative and is entirely "welfare dependant"? It is time for zoos to realize that genetic competence **and physical, behavioural and social competence** are co-equal in determining animal well-being and in sustainable population management. Environmental and behavioural enrichment must become more than feel-good toys for bored animals in sterile enclosures, important as this work is, and become recognised as the foundation for achieving long-term physical, behavioural and social competence.

Types of competence leading to survival in the wild, but not sufficiently considered for animal populations under human care.

Genetic Management is the gateway for maintaining long-term genetic competence

Environmental Enrichment is the gateway for maintaining long-term behavioral competence

Environmental enrichment, as the main tool for maintaining long-term behavioural competence for zoo animals, deserves to be as well supported and as important as long-term genetic management!

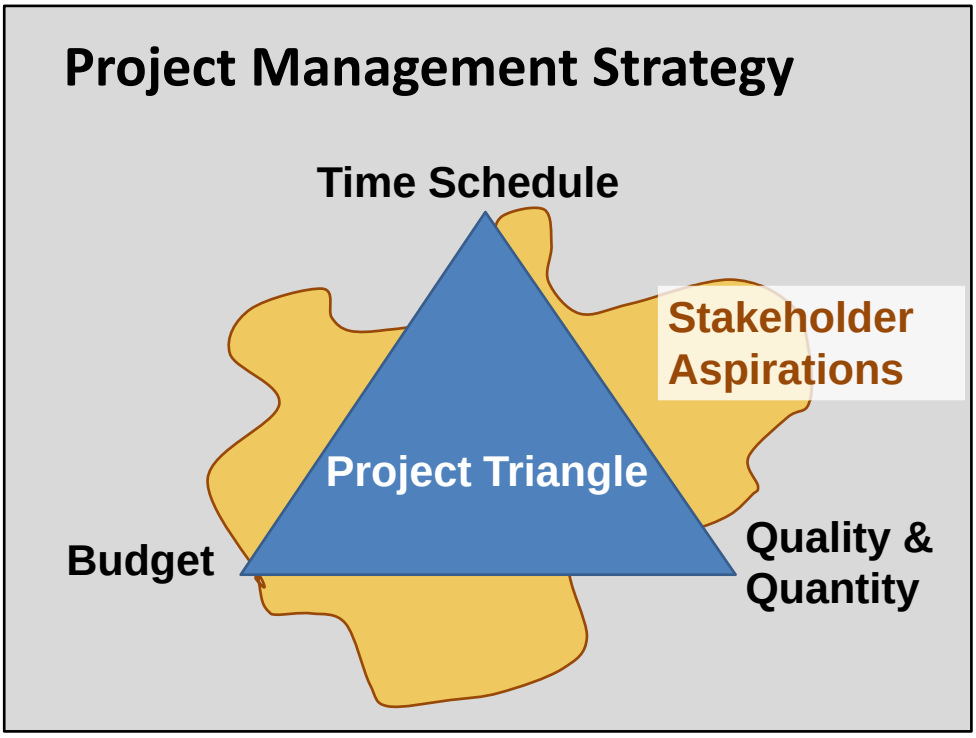
6. Project Charter and User Bill of Rights

What are the rights of:

Zoo Animals, Workers and Volunteers, Visitors, Free Ranging Wildlife, Plants, Zoo Business?

- Respect
- Safety
- Enjoyment of life
- Access to critical resources
- Optimum welfare for individuals and species
- Choice, control and Variety

First understand that design decisions which create winners and losers are not the best decisions. For example we often hear the question, which are most important for zoos, the visitors or the animals? This is a divisive and unhelpful question. We all want design and management policies which elevate both animals and visitors as well as staff and the business corporate. One way to achieve this, or at least not to leave any stakeholders out, is to start by convening an interdisciplinary group to develop a Charter or "Bill of Rights" of all stakeholders. This includes people representing both zoo and local free-ranging animals, local and display plants, zoo staff and volunteers, visitors of all types and the zoo as a self-sustaining institution. When we outlined the basic needs of each group we find a surprising similarity. It is this congruence which allows us to seek synergies benefiting all, or at least most stakeholders. Please note this usually **begins with simple respect for the rights of living things, including living organizations, to co-exist.** This approach was tested at Melbourne Zoo in 2018 in the Leopard Ridge project. The team listed the reasonable rights of each stakeholder, cross referenced them and found these five listed on the slide to apply to every stakeholder. During the design process, every time the project had to be brought back into budget, these factors formed a check list to insure no basic rights were lost. The result was that when the project opened all of the environmental enrichment feature were realized and none were lost to budget cuts.

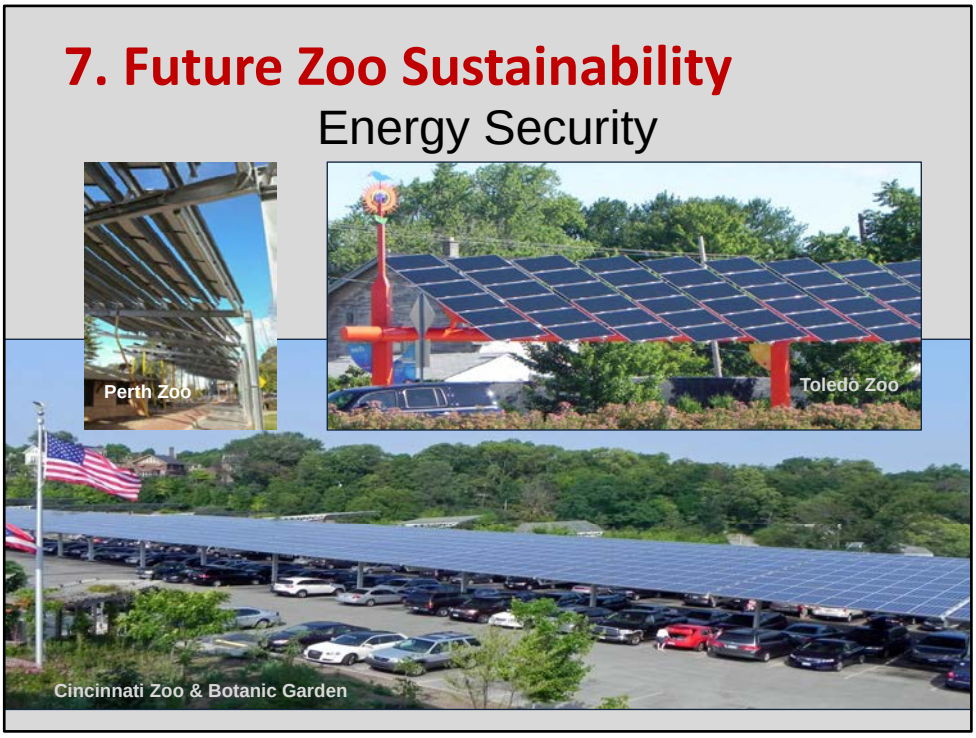


This diagram, developed by Mr Richard Rowe, then Operations Director at Melbourne Zoo, guided the project design and implimentation process. The amoeba-shaped area represents unintegrated stakeholder aspirations. For them to be realized, Richard noted, they must fit into the project triangle of time, schedule, required quality and quantity and available budget. This diagram, along with the stakeholder rights list, was brought out at each design and value engineering stage to insure the best possible project resulted.

Commercial cross-over ideas. In overly compartmentalized, zoos, commercial opportunities are often overlooked in exhibit design. Here is an example of the coffee shop at Werribee Open Range Zoo whose windows are aligned with the morning basking preferences of meerkats in the adjacent exhibit.

Bali Safari and Marine Park Photo: R. Tenaza

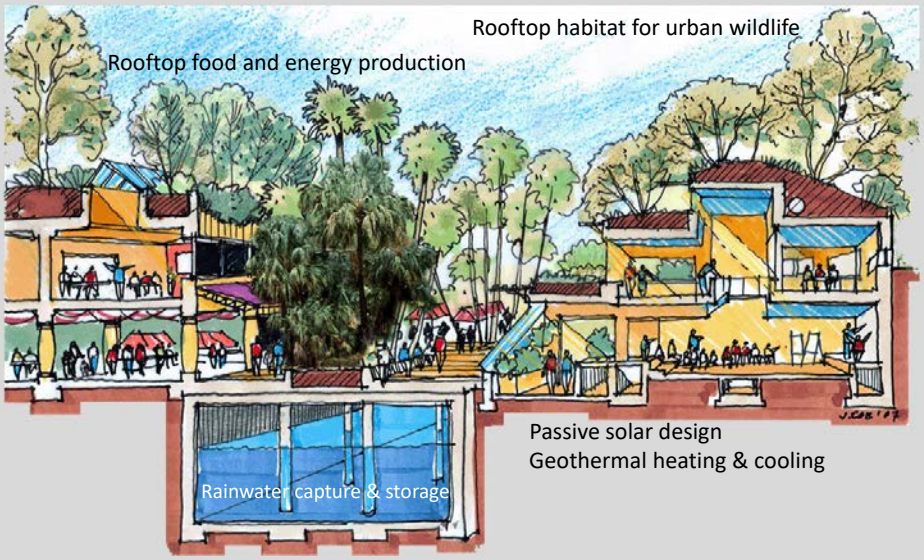
The Bali Safari & Marine Park in Bali, Indonesia, which I helped to design, features the popular Tsavo Lions Restaurant. Note the placement of the lions above the visitors, the perimeter pool to keep the lions from foot printing the windows while reflecting the landscape beyond. This lion exhibit area also is part of the park's safari tour.



Cincinnati and Toledo Zoos in the US are becoming self-sufficient in energy. Cincinnati Zoo now generates over 40% of its electrical energy and will soon meet 100% of it water needs through rainwater capture and storage. Perth Zoo has made small, but significant use of solar panel shading. Denver zoo is collecting combustible waste from not only its own grounds, but also from the Denver Museum of Natural History, the Denver Botanic Gardens and Park Department and exporting surplus energy back to the community through its trash to steam plant! Wellington NZ and Melbourne Zoos are now net zero carbon through energy conservation and carbon credits programs. But these are exceptions. The great majority of zoos I've spoken with have no long-range action plans for security in energy, water, food and weather emergencies.

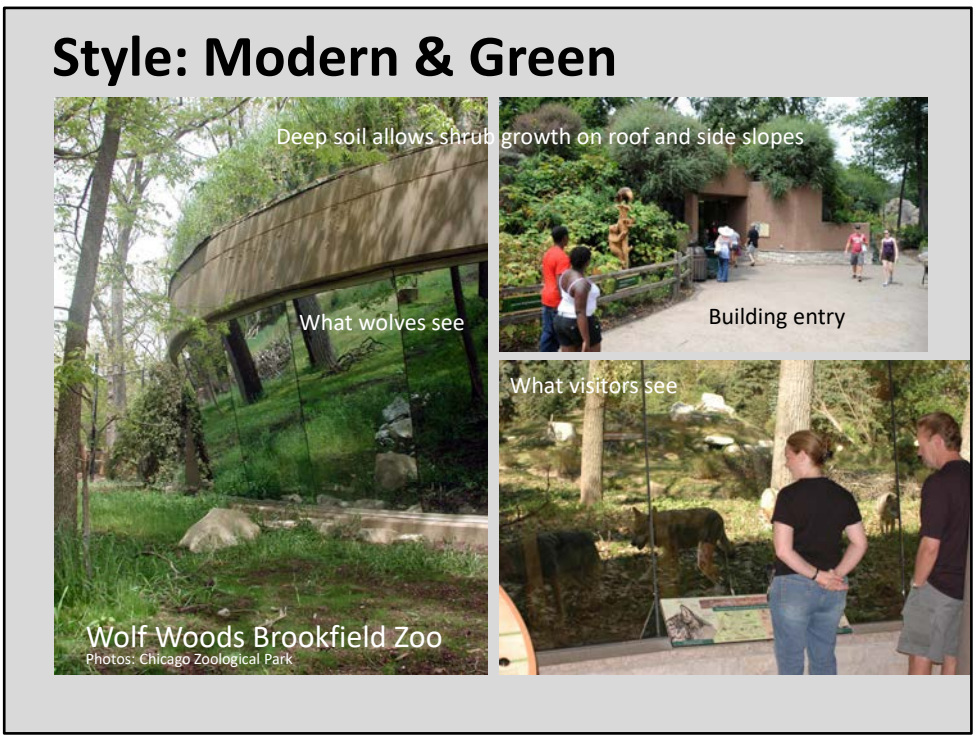
Zoo Sustainability

Deep Green Architecture



Ultimately, the goal of sustainable landscapes is the transformation of culture – the taming of technology, the emergence of a new environmental ethic, a new measure of life quality, and a substantially broadened sense of community including not only humans, but all of life." Robert Thayer (1994).

While many new zoo projects achieve platinum ratings for sustainable construction, design and future demolition, I consider them to be "shallow green". New zoo design and construction should be "Deep Green", meaning as self-sufficient as possible while growing food and creating liveable ecosystems for indigenous wildlife as well as "climate refugee" animal rescues.



Architectural styles come and go with each designer generation believing theirs is the only true style. Zoo design in North America was lead by architects until the last three decades and is now led by landscape architects (like me). However in Europe style conscious architects still seem to determine the look and feel, if not also the function of zoo exhibits. For densely developed smaller zoos, like London Zoo, I agree with the premise of 'authenticity"; "what you see is what you get" using sustainable "deep green" design principles as illustrated in this wolf viewing building I designed with my old firm CLRdesign for the Brookfield Zoo in Chicago. **1)** Response to wolf needs: these Mexican wolves will be producing offspring for rewilding projects, so the design enables visitors to have a close view without the wolves seeing the visitors. This was accomplished by using sloping one-way (mirror) glass. Double glazing reduced acoustic as well as heat transfer. **2)** Visitors are placed slightly lower than the ground outside, so they "look up" to the wolves. **3)** The building is highly energy efficient and covered with living plants producing oxygen, capturing carbon and enhancing the landscape.

ZSL Future Directions?

Jon Coe's recommendations

1. Embed your "message" in everything you do and build
2. Determine your own path, don't copy other zoos
3. Set your own best practices and let others copy them
4. Set a course for sustainable operation 30+ years from now
    a. Future resource security
    b. Animal species triage…what will you be able to do best?
        - Species adapted to your(changing) climate
        - Smaller active species compatible for rotation
        - Public displays featuring active, "appealing" species
        - Large back-of-house areas for breeding and maintaining important but "less attractive" conservation species
    c. Determine your special opportunities
        - What are you good at?
        - What can you afford while maintaining high standards?
        - What long-term partnerships should you seek/optimize?
        - What will have the best possible local and global impact?
        - What will have the best possible support for your social contract?

4. Optimize and differentiate opportunities between the two very different sites.
5. Plan thoughtfully, but don't delay, "learn by doing"

I've added these thought after our 30 July Skype Planning Group conversation.

ZSL Future Directions Jon Coe's recommendations

recommendations

London Zoo

Support the message of authenticity. *"Come and see why the animals in our care are important, how we provide them with the best possible levels of wellbeing, supporting our urgent international conservation mandate, while discovering how your actions can make a positive difference!"*

Your exhibits and management practices would be nature-based and nature-inspired, supported by science, but would clearly include features not found in nature such as overhead and on-grade trails, animal activated technology and virtual presentations, all skilfully integrated in to your lovely and historic city park**.**

Whipsnade Zoo

Use some landscape immersion exhibits with lots of built-in and changeable biomorphic enrichment opportunities. With animals that like to bathe or swim add animal activated underwater jets or bubble curtains to play in. Add things that move, like "wobble logs" and "sway branches" and other moving feeding situations (slide 25) and mind the Coe – Jones Rules of immersion design. Consider rotation. Several linked exhibits (slide 70) could be time-shared with Asian otters, tapirs, tigers, arowana and perhaps Burmese pythons (I assume pythons and arowana can be trained to rotate on que) for example. Consider simulating one of your field research camps. Avoid "cartoon immersion" in which recreations of trees, geology and cultural features are abstract and cartoon like.

End of presentation. I hope you have found it useful. Good luck!