



World Association of  
Zoos and Aquariums  
**WAZA** | *United for  
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**Future of  
Zoo and  
Aquarium  
Design**

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Susan A. Chin<sup>1</sup> & Markus Gusset<sup>2</sup>

# Editorial

We are pleased to bring you the first WAZA Magazine dedicated to exhibit design at zoos and aquariums. Why would we focus on design when there are so many pressing issues facing zoos and aquariums? Simply put, design is a critical tool that can shape our animals’ well-being and our visitors’ experiences. It determines how we tell our stories and creates the primary physical interface with our visitors. It influences the efficiency and effectiveness of our facilities and significantly impacts animal care and welfare. Zoo and aquarium design should not be simply about creating novel ways to house and view animals; it has to serve a greater purpose, one that engages our visitors in our conservation and animal welfare missions.

Over the past few decades, the complex and unique considerations that go into designing zoos and aquariums has led to the emergence of a highly skilled and motivated cadre of zoological design specialists. The articles that follow examine questions around the future of zoo and aquarium design from the perspective of some of the leading practitioners in the field, all of them members of or affiliated with WAZA.

Design for zoos and aquariums involves much more than “enclosure design”. In addition to animal exhibit spaces, it is vital to consider behind-the-scenes management and support areas, associated public spaces and tactical approaches to story-telling, including high- or low-tech interpretive media. As we think about the future of zoo and aquarium design, it is important to consider the advances of the past and to pose key questions about the directions in which our institutions may evolve.

*What is our mission?* Each zoo or aquarium will have a specific mission relevant to their organisation and cultural context, but today most are (or will be) defining themselves in the broader context of supporting conservation. Holistic integration of our conservation mission from animal exhibits, to merchandise in the gift shop, to marketing is essential. We need to be engines for conservation funding, innovators of research and science that support conservation, stewards and propagators of insurance populations and – perhaps most critically – places that facilitate conservation awareness and action for our millions of visitors.

*Who are our audiences and what do they want?* This will differ depending on location and history. Understanding not just sociological and demographic composition of our audiences, but knowing more about visitors’ expectations will give us a framework for designing meaningful and engaging visitor experiences.

*How do we stay relevant?* Understanding why we are or are not relevant to different audiences can help us design exhibits to reach a broader audience. Increasing our visitors’ understanding of the important conservation and science work done at zoos and aquariums can help create relevant connections. Also, as zoos and aquariums are increasingly involved in local conservation projects, we are positioned as a source of environmental information and opportunities for action.

*How do we define and design our visitor experience?* Our unique and defining element is living animals. How do we facilitate and interpret staring into the eyes of another species; contact with another sentient being? How do we use this to best effect? In many places, zoos and aquariums are an antidote to urbanity; a place to connect with nature and escape daily life. People have always come to zoos and aquariums to make memories and we facilitate this important social bonding experience.

*What are the most impactful and appropriate design strategies?* Landscape immersion can be an effective strategy in some situations, but it is not necessarily appropriate everywhere. How do we use *all* of the tools in our toolkit to engage our visitors? Graphics, interactives, technology, events, programmes, live interpretation can all play an important role in achieving our goals and they all have design implications.

*How can we support our mission with design?* Opportunities for new revenue streams can be thematically integrated into master plans and new exhibits to support financial growth.



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Good zoo and aquarium design engages our visitors in our conservation and animal welfare missions.

*What are the elements of design that facilitate the best in animal care and welfare?* Designers focus on the public experience, but without good support spaces and infrastructure, zoos and aquariums cannot function. Animal holding spaces, life support systems, propagation spaces are just a few of the necessary programmatic needs. Best practices in husbandry and animal welfare reveal changing physical and psychological needs, which can be facilitated by good design.

*How do we use design to support sustainable populations?* As we design master plans and individual exhibits, we need to consider space for propagation and science. Partnerships with other zoos and aquariums can provide shared resources of space, scientific expertise or funding and including these programmatic elements in design can support collective efforts for conservation and sustainable populations.

The projects featured in this edition of the WAZA Magazine illustrate a variety of responses to some of these questions. In a time when the role of our institutions is increasingly subjected to scrutiny and criticism, and yet the need for what we offer is growing, the importance of good, holistic design is more important than ever. ■

Peter Rasbach<sup>1,\*</sup>

## Zoo and Aquarium Design – Yesterday, Today and (the Day after) Tomorrow

### Summary

This article provides numerous examples of exhibits throughout the recent history of zoo design. These examples range from the invention of immersing exhibits and their global spread, to exemplary exhibits where size matters, to important design considerations. The development of zoos and zoo design runs in parallel with one another.

### “Zoos and Aquariums Are not for Animals, They Are for People”

This criticism, which is often raised by zoo opponents, is increasingly also being shared by zoo experts. Nevertheless, or specifically as a confirmation of this, over 700 million people a year visit one of the more than 1,000 organised zoos worldwide, with the trend rising in line with a growing human population and the associated alienation from nature. With this, a continuing negative process from the 1980s and 1990s is being reversed, in which the question regarding the purpose of such facilities is concerning the public with unprecedented clarity and radicalism. Permanently and increasingly in recent times, society is dealing with the controversial question of the right to keep “exotic animals” in “captivity” and “exhibit” them. In addition to the basic question of ethics, size, safety and particularly design are being critically questioned.

Which task must zoo design perform in this area of conflict? The large city zoos that were created after the French Revolution in Vienna, Paris, London and other locations, show exotic animals in ethnographically orientated, stylised structures with small iron cages and generously sized visitor areas. In addition to purely satisfying curiosity, with the establishment of zoological societies in London, Frankfurt and New York, the seeds are sown for interest in the morphology of animals and initial serious research in the mid-19th century. Botanical and zoological gardens evolve in parallel, with few exceptions.

In 1907, in his zoo in Hamburg-Stellingen, Carl Hagenbeck presents the innovation of animals in open enclosures, in spacious, replica panoramas, thereby sustainably revolutionising zoo architecture. In spite of these beginnings, after the end of World War II, a long period begins during which animal enclosures are planned and built according to hygiene considerations and with the aim of breeding successes being as comprehensive as possible. Concrete, tiles, glass and stainless steel, all products of the human environment, widely determine the zoo structures of those times.

The collections of zoos continue to be supplemented from the wild. In spite of increasing knowledge about the medical and behavioural requirements of the animals, these circumstances continue into the 1980s. During that time, local authorities and sponsoring organisations support and promote zoos as culturally important facilities. However, zoos were and are always essentially an emotional matter.

### Immersing Exhibits

With their master plan for Woodland Park Zoo, Jones & Jones sustainably influence the zoo architecture in 1978. In a landscaped zoo, animals and visitors are integrated into recreated biotope or ecosystem scenarios resembling the wild, based on the *immersion principle*.

Facilities attempt to simulate a nature scenario as precisely as possible, by showing animals as living, interactive parts of the landscape in their natural communities and to integrate the viewer by using the same type of characteristic design elements (plants, rocks, soils, etc.). Boundaries are hidden or, if they are obviously identifiable as being artificial, they are allocated to the viewer; steel nets or glass fit better to an observation hut than into a wild environment. A maximum experience value is achieved for people and animals, where facilities can be wandered through and unexpected and exciting encounters occur, with the aim of stimulating all senses. This new design language quickly spreads in the Anglo-American region, where zoos such as in San Diego, Cincinnati and New York still have a model character today.

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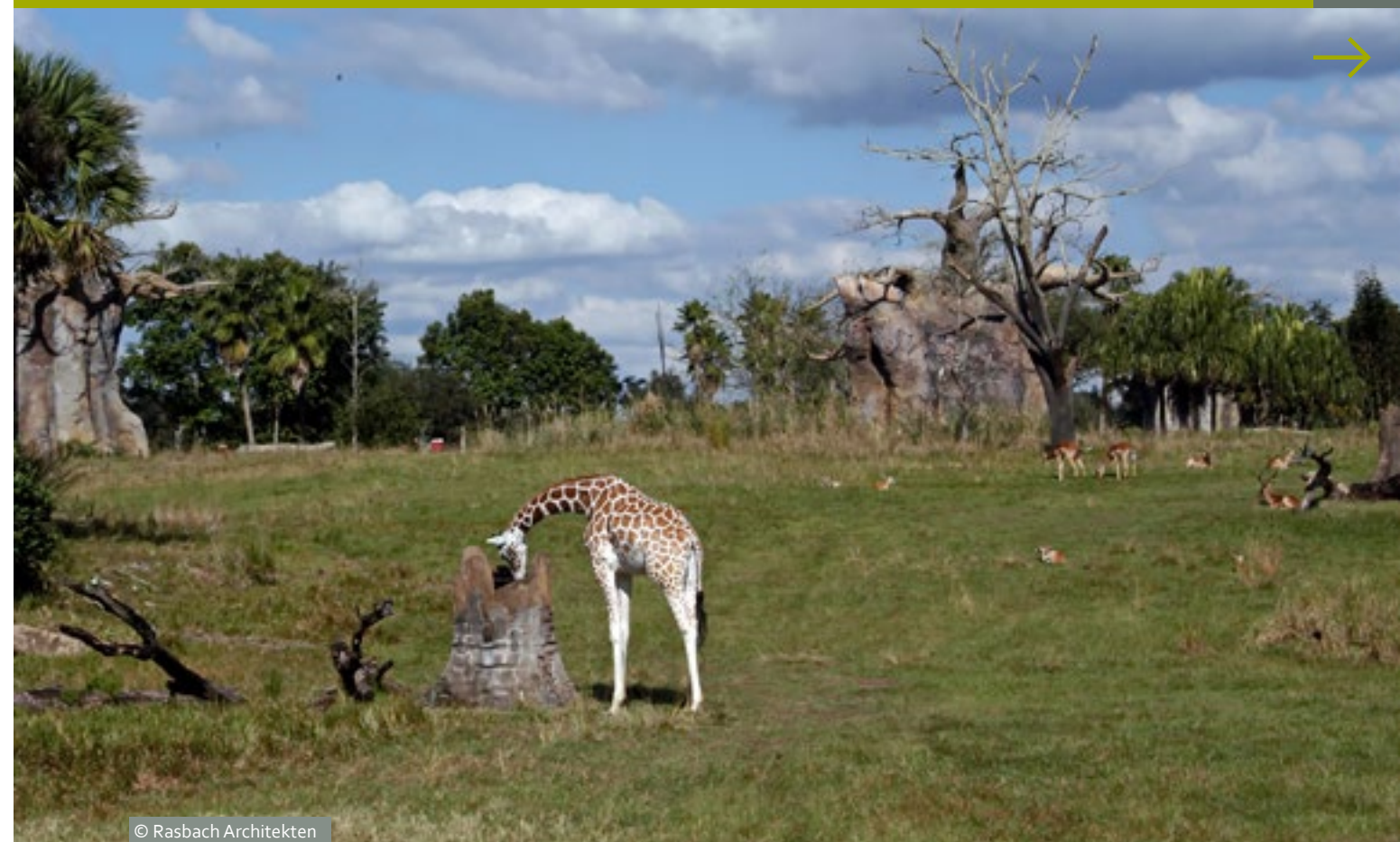
© Rasbach Architekten  
30,000 m<sup>2</sup> of indoor and outdoor enclosures for primates at Leipzig Zoo's Pongoland.

Through adapted projects, the design principle enters into Europe, first with Burgers' Zoo (eco-displays) and Rotterdam Zoo in the Netherlands, and with Basel and Zurich zoos in Switzerland, to then set new benchmarks in Germany in 1996 with the Gorillaberg at Hanover Adventure Zoo. Since then, comparable projects have followed in many zoos around the world. These projects have in common that in addition to the optimum keeping and presentation of the animals, the methods of leisure parks are being used to a varying extent, in an attempt to integrate humans and animals into a common scenario, which is intended to convey sympathy and understanding, practical knowledge and the incentive to deal with the animal and its habitat.

These habitats take place in extensive mixed-species exhibits (e.g. Kiwara-Savanne at Leipzig Zoo or Savanna at Borås Zoo); diverse, thematically laid out enclosure sequences (e.g. Tiger River at San Diego Zoo, Jungle Trails at Cincinnati Zoo & Botanical Garden or Congo Gorilla Forest at Bronx Zoo); or climate shells with controllable conditions (e.g. Jungle World at Bronx Zoo, Lied Jungle at Omaha's Henry Doorly Zoo & Aquarium or Burgers' Bush). This still trend-setting design approach is characterised by a high degree of perfection in front of and behind the scenes. One of the implementations of this philosophy, and still the most consistent, is Disney's Animal Kingdom that opened in 1998 and only shows animals in two geographical zones.

### Size Matters

Even if it does not generally apply that size alone is not decisive, but the quality of an animal friendly habitat scenario is determined by numerous species-specific factors, the realisation is also manifesting itself in professional circles that for several species, such as elephants and bears, but even for the socialisation of herd animals, or species that tend to encounter one another rarely in nature, large, well-structured enclosures are a compulsory prerequisite.



© Rasbach Architekten  
Kilimanjaro Safari at Disney's Animal Kingdom.



© Rasbach Architekten  
Mixed-species exhibit with black rhinos, cheetahs and patas monkeys at Leipzig Zoo's Kiwara-Kopje.





© Rasbach Architekten

Open ocean pool behind the world's second-largest underwater viewing panel at S.E.A. Aquarium.

## Zoos, Aquariums and Their Design – Quo Vadis?

The development of zoos and zoo design runs in parallel with one another and so rapidly that it is barely possible to obtain an overview. New ideas that come up again and again to reinvent the zoos of the 21st century – entirely as intended by animal rights activists – as substitute “electronic zoos” will remain on the fringes, because nothing can truly replace the experience of coming eye-to-eye with a living being, to hear, smell, observe and maybe even touch it.

Also, spectacular design approaches – such as the 2014 master plan for Givskud Zoo as a cage-less zootopia park without enclosures, in which the visitor is intended to be a guest with the animals – must still be put to the test, with respect to their potential to be realised. Visitor participation will increase, following the example of Bronx Zoo's Congo Gorilla Forest, where at the end of their visit, visitors can individually decide on touch-screen monitors which *in situ* projects the (separately charged) admission fee should be used for.

The most recent developments are creating habitats in mega-halls (e.g. Gondwanaland at Leipzig Zoo or Jungola at Wildlands Adventure Zoo Emmen); are attempting unusual and exciting socialisation in extensive enclosures (e.g. Kiwara-Kopje at Leipzig Zoo or Giants of the Savanna at Dallas Zoo); or are forming underwater worlds in new dimensions (e.g. Chimelong Ocean Kingdom or S.E.A. Aquarium). Here, zoo design is gauging the limits of technical pos-

sibilities, in order to facilitate previously unknown animal encounters and increase the experience character and authenticity for animals and visitors alike. Even though large investments will always be criticised by zoo opponents, a larger target group will be reached through the increased attractiveness and therefore also the chance for a deeper understanding and awareness.

### Design Matters

Some current zoo design trends show irritating solutions. Financial constraints, regulation frenzy for awarding contracts and the wish for individuality and originality, in particular, have led to architectural recourse to eras that were considered long overcome in recent years, through the associated competition procedures. Museum-like architectures with pieces of artificial rockwork as wallpaper are “sold” as natural habitats; barriers between animals and visitors are accepted or even emphasised; and exposed concrete and stainless steel have returned.

Although many years of experience have shown that the natural requirements of zoo animals can also be comprehensively satisfied with artificial materials, comparative scientific studies have shown that the stress hormone level of marmosets, for example, is significantly lower in naturalistic enclosures (research by Udo Ganslosser and Annika Schimmelpfennig). With high probability, it can be assumed that this result is applicable at least to other highly developed animal species. Therefore, the partially complex, naturalistic design of a facility is not only of significant importance for the human viewer, as is so often pointed out by zoo opponents, but also for the well-being of its inhabitants.

With the integration of appropriate elements of environmental and behavioural enrichment and the facilitation of interaction between the animals with one another (social groups), with visitors and keepers (e.g. commented feedings) and other animal species (e.g. through socialisation and visual or olfactory stimulation), zoo design approaches one of the remaining problems, too. Rotation enclosures and trails across visitor walkways for species of all types and sizes represent current trends.

However, in order to obtain the moral legitimacy at all, those zoo representatives of their conspecifics in nature must find a habitat that is – uncompromisingly – designed according to the latest knowledge of zoo biology and is continuously adapted and developed, as manifested by WAZA in *Caring for Wildlife: The World Zoo and Aquarium Animal Welfare Strategy*.

The zoo of the future must continuously be aware that to fulfil its undisputed scientific, ecological and social functions, the acceptance and approval of the visitors are essential and for this, it must use a contemporary presentation, naturally, in addition to optimum animal keeping. ■





L. Azeo Torre<sup>1,\*</sup>

# Advocacy Through Thematic Design

## Summary

Designing zoo exhibits is one of the most exciting and rewarding facets of the design profession. By its own nature, exhibit design is a comprehensive wedding of the professions of architecture, landscape architecture and interpretive/graphic design. "Painless learning" must be achieved with exhibits telling complete stories delineating the interconnectedness of everything, through longer, more complete immersive experiences allowing saturation of substance, offering hope and prospect: how can I help?

## Introduction

We must be story-tellers, creating an emotional bond between our guests, wildlife and wild lands. In many ways, our efforts to create this emotional bond to wildlife and environmental issues follow the same formula as in creating a great movie. We introduce a concept, develop the story and offer closure at the end of the experience to create an emotional bond with animals and environmental issues. Movies accomplish the bond with its actors and stories in less than two hours, engaging our emotions with the storyline. We have the same opportunity to create the same kind of in-depth experience through multiple hours and visits to our facilities annually. Like a good movie, we must place our visitors into a truly *in situ* experience, surrounded not only by nature but also the ongoing chronology of humankind, engaging the visitor in a total experience and the opportunity of true immersion to experience life on earth by being totally transported to those places – creating advocacy for conservation. Albert Einstein's famous  $E=MC^2$  is our inspiration to create our own formula for creating dedicated environmentalists to advocate for conservation:

Emotional Bond = Humankind's Connectedness × Humankind's Commitment

$E=HC^2$

By making our exhibits complete in the *in situ* concept, we surround the visitors with all issues, immersing them in the earth's ongoing chronology, geology, geography, art, culture, history, sociobiology and connectedness to all living things. This total immersive story-telling concept brings the world to many who will never have the chance to see all of these wonderful things. Parents will see their children engaged in eye-opening activities and events. Zoos know no boundaries when it comes to educating and entertaining all ages, economic levels and physical challenges. We simply must do more for global issues in more ways by engaging our visitors with these total immersion experiences that create the emotional bond necessary for compassion and mindfulness and the desire to create change.

What are some facilities that have accomplished this goal of  $E=HC^2$ ? Here are a few examples that I have had the pleasure of working with.



© Torre Design Consortium

Northwest Passage exhibit for polar bears at Memphis Zoo.

## Memphis Zoo

Memphis Zoo in the mid-1980s had never been able to exceed its annual 400,000 visitor attendance ceiling and was operationally subsidised 75% by the City of Memphis. After an ambitious master plan that promised to unite modern Memphis with its namesake, Memphis of the Antiquities, a series of dramatic exhibits evolved. Starting at its entry where visitors could move through the ancient portals of the Temple of Memphis to the hypostyle court Nile exhibit, Orientation Plaza and Cat House Café, the 5,000-year link between modern and ancient Memphis was established, giving excitement to all that came to visit. The exciting columns and detailing were not as grand as found in stone at the original temples, but for the average person who may never see these temples and hieroglyphs as they are in Egypt, the experience at Memphis Zoo's entry complex took them to faraway lands that they might never have the experience of seeing first-hand in their lifetime. Well received by everyone, the success led to a series of new exhibits, with half of the construction costs coming from philanthropic gifts. We had created something of value, which was recognised by daily visitors as well as potential philanthropists.

The Giant Panda exhibit (the last in the USA) tells the story of China itself, its art and architecture, culture and history, and introduces the giant pandas in an elegant and meaningful way. The Northwest Passage exhibit presents the journey of the First Nations Peoples across the land bridge of Beringia 10,000 years ago, featuring polar bears, sea lions and a host of animals as discovered by the Tlingit, Haida, Tsimshian, Kwakiutl and other tribes. Their art and architecture were displayed in equal measure, making the exhibit a unique experience in both daytime use and after-hour events.

The final piece of the puzzle was the creation of the Teton Trek exhibit, a grand but simple exhibit featuring grizzly bears, wolves and elk. The centrepiece, Old Faithful Lodge, created with heavy timber detailing, broad porches and rocking chairs, allows the visitor to sit and enjoy the animals for hours, effectively creating a totally immersive experience that would otherwise require a 1,500-mile journey instead of a 15-minute drive for some from nearby neighbour-

hoods. It is this "transporting the visitor to the believable *in situ* experience" that helps to build the emotional bond through connectedness to the experience to underpin the commitment to conservation of these wonderful wild things and places.

Today, Memphis Zoo receives 1.1 million visitors annually and is 97% self-sufficient. Much of this success comes from non-traditional revenues and after-hour events and parties that some zoos have dabbled with; however, underestimating (monetarily and emotionally) the value of such activities. To book a wedding at the iconic Teton Trek Old Faithful Lodge, one must be prepared to wait 18 months for that reservation! It is hard to believe that kind of attraction value in a zoo. With all of these visitors using the facilities and learning more about the facilities' mission and vision, the more opportunity to develop more advocates. As a result of this success, Memphis Zoo annually contributes over US\$ 1 million to conservation.

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## Tampa's Lowry Park Zoo

One of the first manatee complexes to be built in the USA, the Florida Biome exhibit at Lowry Park Zoo is both an ecological and chronological transect. Starting over 200 years ago in Florida's development, the visitors move from the north to the south, from "cracker shack" to oak hammock to cypress dome, eventually submerging into the estuaries and rivers where they come face-to-face with manatees and an abundance of fishes, reptiles and amphibians. The story of humankind is presented in the sequence, juxtaposing adaptation and ongoing evolution that is balanced by humankind's urbanisation of this 1,000-mile peninsula transect.

The manatee is clearly the motivator for conservation here, as one has the opportunity to see the affection and elegance of the mammal that humankind challenges. To offer closure (and prospect) at the completion of this experience, the Manatee Hospital was created. Over 300 injured manatees have been healed here, their challenges brought to the eye of exhibit visitors and they are triumphantly released back into the wild – the inspirational message: we can make things better. After a red tide bloom killed a record number of manatees in 2013 by releasing toxins that paralysed and drowned the manatees, the Manatee Hospital discovered that manatees could be saved with life jackets and even pool noodles. Now researchers worldwide can implement similar solutions discovered at Lowry Park Zoo, showing, again, the value of zoos in creating commitment to environmental issues and promoting solutions.

Lowry Park Zoo has been operationally self-sufficient for decades, with an attendance of over one million visitors per year. As a result of the zoo's financial success, it contributes over US\$ 1 million annually to conservation.



© Torre Design Consortium

Teton Trek exhibit for grizzly bears, with Old Faithful Lodge, at Memphis Zoo.



© Torre Design Consortium

Florida Biome exhibit for manatees at Tampa's Lowry Park Zoo.



© Torre Design Consortium

Great Maya Reef at Audubon Aquarium of the Americas.

## Audubon Aquarium of the Americas

New Orleans' Aquarium of the Americas has been a successful aquarium for decades. Like many other "modern" aquariums, it is a building filled with beautiful individual exhibits; however, linked by "battleship grey" interior spaces with exposed ductwork and wire raceways. Our most recently completed exhibit, the Great Maya Reef, had high impact for relatively low cost. This exhibit's concept was to simply accomplish in the aquatic business what we have been doing for decades in the zoo business – create an immersive and engaging experience that would believably make the visitor *in situ* in the sunken Mayan city in the Yucatan, the second largest reef in the world. The portal to the exhibit links to the lobby,

enframed by a crumbling Mayan temple complex. As we descend, schooling tanks lead the visitors through the submerged temple chambers with art and artefacts, iconography, thematic lighting and several new tanks being added to the coral tunnel.

The result of this renovation increased attendance by 20% and created something new and exciting, clearly breaking away from the "battleship grey" interior and transporting the visitors 600 miles south and 1,000 years back in earth's chronology. Once immersed, the stories proceed into environmental conservation issues and offer prospect on how you can help.

## Conclusion

These exhibits follow the conceptual script of a movie, with a portal concept, immersive storylines, plenty of hands-on experiences and closure at the experience's conclusion delineating how we can help, with the goal of creating the emotional bond to foster advocacy for positive change through connectedness and commitment to global environmental issues. ■



Charles G. Mayes<sup>1\*</sup> & Ed Mastro<sup>2</sup>

# Showcasing Science and Research

## Summary

The best zoos today are becoming places that care for animals with a focus on their long-term wellness through research, breeding and field conservation programmes. One of the main trends emerging in zoo exhibit design and explored in this article is the accommodation and presentation of research, animal care and breeding programmes being conducted onsite at the institution. This article highlights three examples where staff research and animal care activities have been brought out from behind-the-scenes to become popular and informative venues for the visiting public to observe, interact and gain an understanding of the science and professional animal care that is part of the mission of modern zoos.

## Introduction

Zoos began as menageries where animals were viewed in "pits" or "grottos" and they have been influenced by game farms where deer and other animals were raised and sold. Early game farm operations consisted of herds gathered in fenced enclosures, which sometimes grew to become more like zoos than farms. It is still common for zoos to display herd animals in simple fenced enclosures, and zoos still have elements that hark back to the menagerie or grotto era.

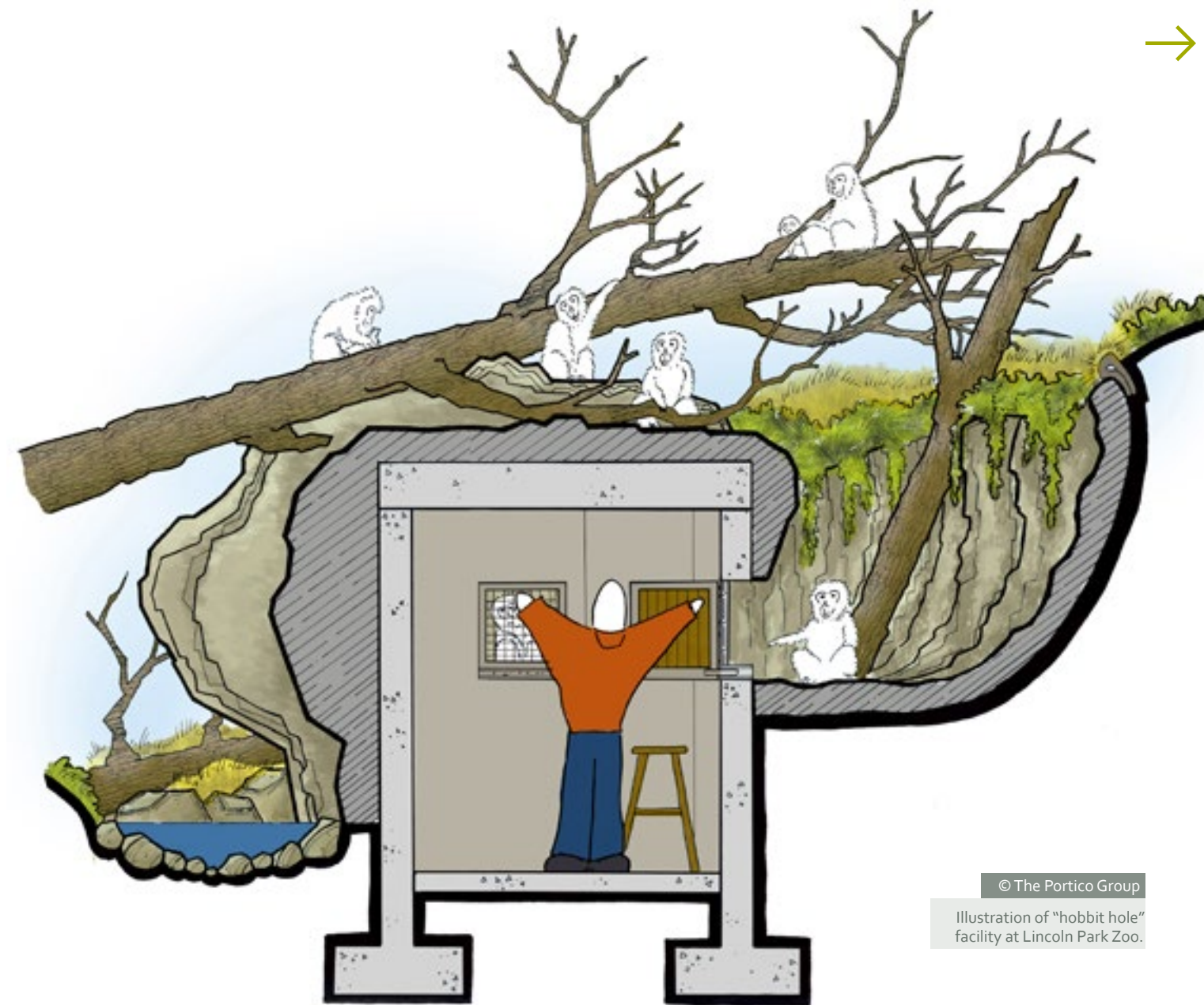
Engaging the visiting public with animal and habitat exhibits is most successful when these close encounters foster an understanding of, interest in and commitment to the conservation of species and wild places. The newest, leading-edge exhibits incorporate complex programmatic elements that are not only beautiful and popular with visitors, but also address and present the zoo staff's active research and animal care. Modern exhibits immerse visitors in authentic-looking natural environments that minimise the perception of barriers separating animals from the public (and each other) and visitors from staff. The following recent projects provide examples highlighting these trends in zoo exhibits that we are experiencing.

## Chicago's Lincoln Park Zoo – Regenstein Macaque Forest

*Trend:* Integrating and presenting animal care, science and research.

*Programme statement:* Lincoln Park Zoo is actively researching the learning and cognition of animal species, especially primates. A new Japanese macaque exhibit required special consideration to avoid the transmission of *Herpesvirus simiae* (B virus) between macaques and humans. Additionally, the new exhibit gives the zoo's researchers spaces in which to study and interact with the macaques, either in or out of the visiting public's view, depending on the situation.

*Four broad research categories:* Cognition (thinking and perceiving); learning (use of tools, etc.); behavioural economics (social, emotional and cognitive factors influencing decision making); and social behaviour (use of space and food resources). Supporting these research categories, exhibit enrichment elements and interchangeable cognitive research panels are designed to fit in a standard bracket at the research stations. Researchers then develop the panels to meet the needs of each particular study.



*Solution and implementation:* Two areas in the macaque exhibit were designed specifically as research stations and demonstrate the strategies essential for enriching the experiences of the animals, researchers and visitors.

*Controlled access:* Fully separated "clean" and "dirty" work spaces include critically located spaces for transition, Tyvek suit disinfection and keeper shower. The defined waste disposal route includes a waste bag disinfection station. Animal management areas are visible from the clean keeper work areas for observation, which reduces smell, sound, contaminants and animal stress.

*Research station:* With no contact with animals, cleaning access is provided from the exhibit side, and changing of the cognitive research window from the researcher side.

*Visitor considerations:* All viewing areas for visitors are through full-height glass panels to eliminate any contact, but preserve views of the activity. Exterior mesh enclosure is a minimum of about 3 m away from any visitor-accessible areas.

*Research and training:* (1) "On view" approach research station: Smart glass dividers allow the researcher to vary research conditions by adjusting participating primates' views of each other. Speakers and video monitors allow visitors full and detailed view-

ing of the activity, as well as audio access to an explanation from the researcher. (2) "Hobbit hole" facility: This earth-sheltered room, accessible from the holding building via an underground tunnel, is configured to make primates visible to the public while interacting with hidden keepers and researchers. Consideration was given to viewing angles, elevations of the primates in relation to the researchers and visitors, and allowance for flexible and changeable research programmes.

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© Jamie Pham

Glass wall at Los Angeles Zoo's LAIR.

### Los Angeles Zoo – LAIR

*Trend:* Integrating and presenting animal care, science and research.

*Programme statement:* One goal for the design of Los Angeles Zoo's new reptile, amphibian and invertebrate centre (LAIR) was to provide a view for visitors into an active work area where animal caregivers work throughout the day in their normal activities.

*Solution and implementation:* The design for LAIR includes a large keeper and care space divided from the visitor gallery by a floor-to-ceiling glass partition. A two-way voice intercom was provided to allow for conversation through the glass wall and most of the furnishings and equipment in the room were planned to be on casters to allow for flexibility of activities, as well as ease of presentation of interesting animals or staff activities right next to the glass wall. Rolling racks support terrariums and small displays of new arrivals, freshly hatched animals or animals that are being treated for illness or disease. This glass wall view to back-of-house has consistently been a top attraction for visitors to LAIR in the three years since its opening.

### Cabrillo Marine Aquarium – Aquatic Nursery

*Trend:* Connecting guests and the public with actual research science.

*Programme statement:* The Aquatic Nursery is a public exhibit gallery designed as a functional research laboratory where Cabrillo Marine Aquarium aspires to “grow both young sea animals and young scientists”.

*Solution and implementation:* The Aquatic Nursery is designed as a large open space with a series of aquariums sitting on water-tables located in the centre of the room arranged in different “wall-less cubicles”. The space is designed to be completely flexible where aquariums can be easily installed or removed within minutes depending on project needs. Working closely with college-aged mentors, students (age 12–18) are encouraged to complete individual and/or group research projects in the Aquatic Nursery and Cabrillo Marine Aquarium encourages a special emphasis on projects that focus on husbandry requirements of and/or environmen-

tal impacts on southern California marine life. During their projects, students work during the school year to explore the scientific process and develop real research programmes at the aquarium. Every spring Cabrillo Marine Aquarium hosts a Young Scientist Symposium where students present their findings to each other, parents and other onsite guests.

During public hours, aquarium visitors have access to the Aquatic Nursery to view active scientific research and these scientists-in-training. All activities are conducted in full public view. Interpretation is achieved by public engagement by the students and mentors discussing and explaining their projects directly with guests. Hand-written “keeper notes” combined with formal graphics explain the research process, animal care and research findings. Trained volunteers are also used during slow periods of research.



© Cabrillo Marine Aquarium

Aquatic Nursery at Cabrillo Marine Aquarium.

### The Continued Evolution of Zoo and Aquarium Design

The Aquatic Nursery programme is open to all interested students in the region. The facility and programme have enjoyed significant success with its young scientists. Participants have been recognised by numerous awards and scholarship programmes, including one student who won the Intel International Science and Engineering Fair, another won a scholarship in the Gates Millennium Scholars Program and a third was awarded an internship at the California Institute of Technology. Many others have won their local, county or state science fairs.

Today's zoos are helping to shape public understanding of ecosystems, communicate science and conservation messages, and help maintain a connection between people and nature in a rapidly developing and urbanising world. Exhibits, as the focal point of the zoo experience, are a keystone for the long-term success of zoos. Incorporating presentations and displays of the active scientific re-

search and daily animal care activities of zoo staff helps to inspire future scientists and animal care professionals by presenting concrete and authentic examples of the professional and scientific activities that are part of modern zoos. ■





Kieran Stanley<sup>1,2,\*</sup>

# Zoo and Aquarium Design – The impact of Experience

## Summary

When I first encountered zoo architecture some 20 years ago, I quickly realised that it was not primarily about architecture, but about knowledge of the zoo, understanding its cultural and historical background as well as developing its zoological, educational and operational objectives. This insight has shaped my approach to designing zoo projects and, as a result, I see myself not only as an architect but also as a strategic partner who works integratively and holistically to create a sense of relevance for each project.

## Introduction

In my view, the purpose of zoo design – meaning architecture and landscape architecture – is to meet the needs of the animals, visitors and commercial operations and to contribute to four main objectives (as already stated by Heini Hediger): education, conservation, research and leisure. Zoo design should facilitate the work of the zoo and acquaint visitors with its themes, objectives and responsibilities in order to generate interest in nature and species conservation.

Zoos will be confronted with an even greater number of challenges in the future. If they want to survive, they will have to go beyond zoological requirements and also deal with the pressures of attracting visitors, increasing operational efficiency and addressing their critics as well as using their uniqueness to retain their position in the zoological and leisure markets. Now more than ever it is important that zoos develop a sustainable vision. Not only in terms of their commitment but also in terms of being an institution with relevancy – one with the expertise to positively influence their region's development.

We zoo architects will also have to find answers to environmental and economic challenges. This means that designing buildings and landscapes to communicate a zoo's vision will only be one of many responsibilities in the future.

## The Zoo and Aquarium of the Future

I find Jon Coe's predictions reasonable. He is going on the assumption that zoos will follow existing trends in the next 25 years. Such trends, however, are subject to a range of changes, including cultural ones.

For Coe, immersion design represents the *status quo*. Even if it has a global reputation, immersion design is not yet standard practice outside of Anglo-Saxon countries. I think that immersion design, in terms of its original intention, is quite suited for the future. Since story-building – that is, developing a thematic narrative – is a proven means for drawing in visitors emotionally and guiding them through specific themes. I do not mean developing thematic narratives only in a cultural sense, but also in terms of the natural habitat of the animals.

It is clear that zoos have a future. I am convinced that zoos will adapt and diversify and continue to exist – and also foresee the development of zoos with a strong focus on one subject. They remain relevant as places of recreation and education when, for example, their *in situ* and *ex situ* projects succeed in making visitors aware of and bringing alive the concept of biodiversity – locally and/or globally – and generating enthusiasm for wildlife conservation.



© Monterey Bay Aquarium  
Jellyfish encounter at Monterey Bay Aquarium.

## What Characterises Good Zoo and Aquarium Design?

At this juncture, Monterey Bay Aquarium is worth mentioning. Located on the California coast, it has made the protection of oceans its mission. It integrates its location on the Pacific Ocean both architecturally and conceptually in an exemplary way, granting visitors impressive views of underwater worlds – from the adjoining sea to an underwater forest. With its research priorities, changing, curated exhibitions, a variety of tours, its local work and its ambitious volunteer programme, the aquarium truly fulfils its conservation and scientific demands. By speaking to visitors, creating individual encounters with animals and communicating interesting content, it generates sustained curiosity and enthusiasm. Having a personal encounter with a jellyfish, made possible via the spontaneous actions of one of the volunteers, is something my daughters will likely never forget.

Good zoo design begins with understanding. Whether it is during the strategic development planning, the conceptualisation of an immersive environment, a showcase building or an outdoor enclosure, getting to know the needs of the zoo and the users and seeing things from their point of view are, for me, essential aspects. The main protagonists – the animals and their welfare – are the top priority. But zoologists, curators and keepers, zoo educators and operational technicians, from marketing to catering, are also important; each employee has different job requirements. The third group, of course, are the visitors. We as architects have to juggle the very different needs and requirements of those three groups and integrate them into one clear concept.

Chester Zoo is a good example here of the potential that can be unleashed when a zoo develops its own identity. This zoo has managed to define its values, position and voice, to create a mission focus and also to effectively communicate these both internally and externally. What the zoo seeks to communicate has been brought alive; it understands its visitors and is easily accessible. The zoo has developed its own character, which is also expressed in its architectural and landscape design. This uniqueness needs to be developed or visualised during the planning process.

In my view, good zoo design addresses the complexity of everyday zoo life and creates the spatial conditions for daily zoo work, often in limited areas, visualising and bringing these alive, where required, ensuring a smooth, safe and sustainable operation.

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© dan pearlman

Polar bear enclosure at Hanover Adventure Zoo.

With the animals as the focus, design work can no longer be restricted to creating sufficient enclosure sizes. My perspective is similar to David Hancock's: today, it is about creating an adequate living space that replicates the natural habitat of the animals as much as possible, and which is equipped with natural materials, guaranteeing the animal freedom of movement, areas for seclusion and independence, providing variety and security – and then physically take the visitor there, where the animals are; into their domain.

At Hanover Adventure Zoo, the polar bear enclosure demonstrates just how well immersive environments and animal welfare can go together. Despite limited spatial possibilities, the design took into account the needs of the animals and behavioural enrichment played a significant role in its design. The new system has proven itself in only a few years of operation. Today, polar bears from other zoos showing signs of stereotypy are trained at the Yukon Bay immersive environment. The animals are positively affected by the optimal allocation of space, saltwater pool wave system, diversity of materials used in the landscaped areas and variety of activities and feeding options, which can be used for training purposes.

### The Wow Factor and Learning

For a long time, zoos were primarily a recreational space for visitors, where they could watch the animals. Since they are increasingly understood as educational institutions and are committed to the communication of important information, the question arises, how can all visitors be reached and exposed to issues such as species and nature conservation? "Involve me and I will understand". This age-old, basic premise has been shared by a number of philosophers and educators, and is confirmed by neurosciences: we learn best what moves and inspires us emotionally. For many educational institutions this insight is not entirely new, but it often lacks lively and convincing concepts.

I believe that zoo design is capable of doing more than simply creating unique insights into the habitats of animals. It has the potential to deliver valuable information. Zoo design can create an experience – from a special kind of encounter with an animal to immersing visitors into new environments – that makes the successful communication of important messaging highly probable. Only someone who feels personally involved will get excited about animal and nature conservation and hopefully become an advocate for the conservation of their natural habitats. If knowledge is a bank, and imagination the currency, the ultimate future investment is experience.

This idea was our motivation in developing Islands, the immersive environment at Chester Zoo. The zoo is one of the most respected zoos in the world and works globally for species conservation. This commitment – Chester Zoo operates 10 of its own programmes for protecting endangered wild animals and supports 60 other projects – became the central focus of our design. We developed a storyline that directly ties into the zoo's conservation programmes, and an overarching concept for all areas of the zoo (including catering and communication). Islands is modelled after six Southeast Asian islands, bringing the work of conservationists alive and communicating the uniqueness and fragility of the flora and fauna. Through visitor pathways and sightlines, various building styles and plant species, through the use of diverse materials and authentic detailing, we created a lasting, holistic experience. In short, we build stories.

Even smaller zoos can succeed in satisfying the four major areas of responsibility. Brevard Zoo in Florida, for example, the result of a citizen initiative, focuses on education through participation. The small zoo involves the community through its volunteer programme and its visitors via diverse interactions that focus attention on nature and the playful communication of its subject matter. Its conservation projects focus on local issues and the zoo also operates its Sea Turtle Healing Center.

### Conclusion

I do not think that every zoo has to showcase the top-10 species to be relevant. Rather, zoos are relevant not only by focussing on their four main objectives, but also by developing their own signature and derive their own uniqueness from within. Many zoos have already made progress in this regard. Fate led me to zoo architecture and as an architect it is enriching to be involved in the development of these socially important institutions and to work together to secure their relevancy in the future. ■



© Chester Zoo

Special encounter at Chester Zoo's Islands.



© Brevard Zoo

Kayaking at Brevard Zoo.



John Kemper<sup>1,\*</sup>

# Designing Zoos and Aquariums as Conservation Organisations

## Summary

Zoo exhibits of the future will demonstrate to the public how zoos participate in and drive conservation of species and habitats. Exhibits will evolve to be bigger in size, contain multiple species and offer more choices to the collection. Education opportunities will permeate the experience by being integrated with exhibitry, and animal welfare components of behind-the-scenes areas will be accessible, under special circumstances, to select zoo visitors. The zoo experience will include a greater variety of non-traditional ways of engaging with animals, including more complex touch and feeding experiences, and more meaningful connections through our smart devices.

## Zoos and Aquariums Need to Explain What They Do

While conservation of wildlife is the core purpose of today's zoos, I believe that the general public does not understand this. Without a doubt, zoos of the future will become focused on telling the conservation story; so much so, that the general public will inherently recognise that zoos are the largest collection of dedicated professionals working towards a coordinated goal of saving species across the globe. Conservation will be so aligned with the brand of zoos of the future that both the physical setting and the intentional marketing messages will clearly and prominently promote the conservation work undertaken by the institution.

The industry knows that zoos are uniquely suited to own conservation on a global scale. That same industry must educate the public on conservation efforts, or the public will drive zoos out of business by focusing on a wave of social concerns about animals in "captive". We have seen it with orcas. It has already begun spreading to dolphins, belugas and terrestrial animals. Recent studies show that many children believe that elephants do not belong in what they know as a zoo. Those that drive this agenda will successively focus on the next largest or perceived "smartest" species. Programmes like WAZA's Biodiversity is Us and AZA's SAFE are beginning to change the public's perception and understanding of our roles, but much more education must be done. Specifically, the stalwart of animal experiences – exhibits at zoos and aquariums – will be the touch point for delivering that understanding.



Lions overlooking the African savannah at Columbus Zoo and Aquarium.

© PGAV Destinations



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© PGAV Destinations

Guest view from Bear Alley at Louisville Zoo.

## Zoo and Aquarium Exhibits of the Future

I believe that the public will react positively when they fully understand that zoos and other nature-based organisations are saving animals in the wild. When the public eventually puts their trust in the collective mission of zoos, they will develop followers, like there are behind many religions. The brand of zoos will change. Zoo-goers will be saying things like "I believe in what zoos are doing. I will support them because they have it 'figured out'. They are doing the right thing. I will attend because they are doing all of the heavy lifting. I can be effective by just following and supporting". Zoos are already trusted partners (mostly for reasons other than conservation), and will become even more so when the public is fully aware of all the things these organisations already do. Visitors may effectively begin to drive conservation.

Zoo exhibits have transitioned in the last 40 years from sterile, functional enclosures to naturalistic habitats where there is the perception of what it must be like for an animal in the wild. Now, many new exhibits have moved to much larger exhibit areas with less concentration of animals. In exhibits that we have recently designed, like the Heart of Africa at Columbus Zoo and Aquarium, there are multiple acres that comprise a multi-species African savannah. Lions overlook a 4.5 ha paddock that accommodates about 140 hoofstock specimens, including giraffe, zebra, wildebeest, two gazelle species, ostrich and crane. The panoramic view is impressive and serene, comfortable in its expansive setting, yet delivering other close-up experiences that provide a sense of wonder and awe.

The Heart of Africa exhibit actively promotes its conservation efforts with those same species through visual interpretives that introduce programmes, live interpretation during training sessions at specially designed mesh panels for lions and vervet monkeys, and presentations at a flexible yard where cheetahs, warthogs, ostriches and zebras can alternatively use the space.

Zoo exhibits will continue to blur the lines between animal habitats and human spaces, like Glacier Run at Louisville Zoo, were the design purposely created the sensation that polar bears may be in people spaces and *vice versa*; like is actually happening in some Canadian towns. Building on the story of human-animal conflict, we wanted guests to raise the question "Could I now be in a bear space, and not know it?".



Guest view from airplane fusillade at Columbus Zoo and Aquarium.  
© PGAV Destinations



From an animal welfare point of view, zoos of the future may see a radical shift – evolving into multiple specialised experiences that recognise the unique needs of specific species. I would not be surprised if 25 years from now, elephant exhibits are huge expanses of land that are visited by appointment only. Impressive, multi-aged herds will inhabit much larger spaces in matriarchal families where guests may need to travel by golf cart or vehicle to see the magnificent creatures in the space they occupy at that time, on that day. Like hoofstock in large paddocks, elephants' lives will be characterised by choice: where they spend time based on climatic conditions, what and when they eat, how they communicate and how they enrich their lives through interaction with the landscape, water bodies and problem solving. As part of their choice, they will be able to interact with interested observers who have visited to understand elephants better. Solving puzzles, bathing and feeding will become interactive opportunities that benefit human and animal species alike.

In addition to the continued use of concealed moats, invisible fences, landscape immersion, borrowed views and visual integration, exhibits of the future will expand on providing excitement and entertainment by viewing animals from unusual spaces like airplane fusillades and the cabs of Land Rovers. This has been done with great affect at Columbus Zoo and Aquarium, Louisville Zoo and Busch Gardens, coincidentally involving guests in the storylines of the exhibited species. Compelling selfies from such exhibits record happy memories and provide proof of a collectible experience for Snapchat and Facebook. Let us not forget that many families primarily visit for the purpose of a fun day with their loved-ones.

We are currently working with South Carolina Aquarium to design an exhibit that builds the brand of conservation by appealing to young children via hands-on learning stations. Children can rescue an animal, diagnose what may be wrong with the animal and release the animal back to nature. By teaching future generations about the importance of conserving wildlife and the role zoos play in this conservation, these children will grow to understand zoos in a very different way.

Behind-the-scenes visits are being designed into new exhibits from the very beginning. The public loves to understand what it is like for keepers to care for animals. Exhibits of the future will demonstrate how high-tech veterinary care is given to animals every day. Private, up-close experiences like meeting a penguin, or safely touching the paw of a sea otter, are already available in back-of-house areas of several institutions. Keepers and curators will build capacity in this regard, moving well beyond existing revenue generators like giraffes, rhinos, elephants and sting rays.

Hopefully, the result will be that people become more dedicated followers to their trusted partners and take action by changing daily habits to better the planet and the species that live on it. By interacting with a diverse selection of species, the public will begin to understand that we all live in ecosystems that support each other. Supporters will become further educated about the choices they make, and the benefits to wildlife, the environment and themselves.



© Ocean Park Corporation  
Ocean species in domed exhibit at Ocean Park Hong Kong's Grand Aquarium.

### Other Ways that Animal Exhibits Will Evolve

Studies show that the public wants to be excited and entertained, as part of the education that they currently only mildly seek. The following are a few more ways that exhibits of the future will evolve: (1) Additional sources of revenue from retail and food services will be developed and integrated with exhibits; extending the attraction experience and tying the storyline directly to the animals. (2) Special format theatre experiences may replace some exhibits for animals that become unavailable to zoos. Multisensory effects in 4D theatres and sophisticated interpretives will continue to evolve using the latest technology of lighting, cameras, projection, thermography, GPS, radio-frequency identification (RFID) and personal devices. (3) Zoos will further evolve their brand by being leaders in the incorporation of sustainable design into their new animal exhibits and buildings.

### Final Thoughts

Zoos provide entertaining, educational and emotional moments to their visitors. There will always be a demand for this type of experience, especially as the use of electronic devices increases. In recent consumer research with aquarium visitors, unaided, only 1% of the respondents mentioned that "animals in captivity" was an issue to them.

We believe that the collective long-term commitment to conservation is the only way to save many species. Without it, there may be no animals outside of our institutions in the near future. And, as stated by WAZA,

"If zoos and aquariums are to be an active leader in conservation, they must face opposition head-on, by understanding criticisms, adapting where necessary and explaining their actions in a way that gains public support". Exhibits of the future will be instrumental in gaining that public support, by responding to the needs of excitement, connection and education – and becoming an even greater trusted partner. ■



Greg Dykstra<sup>1\*</sup>

# Designing for Active Animals

## Summary

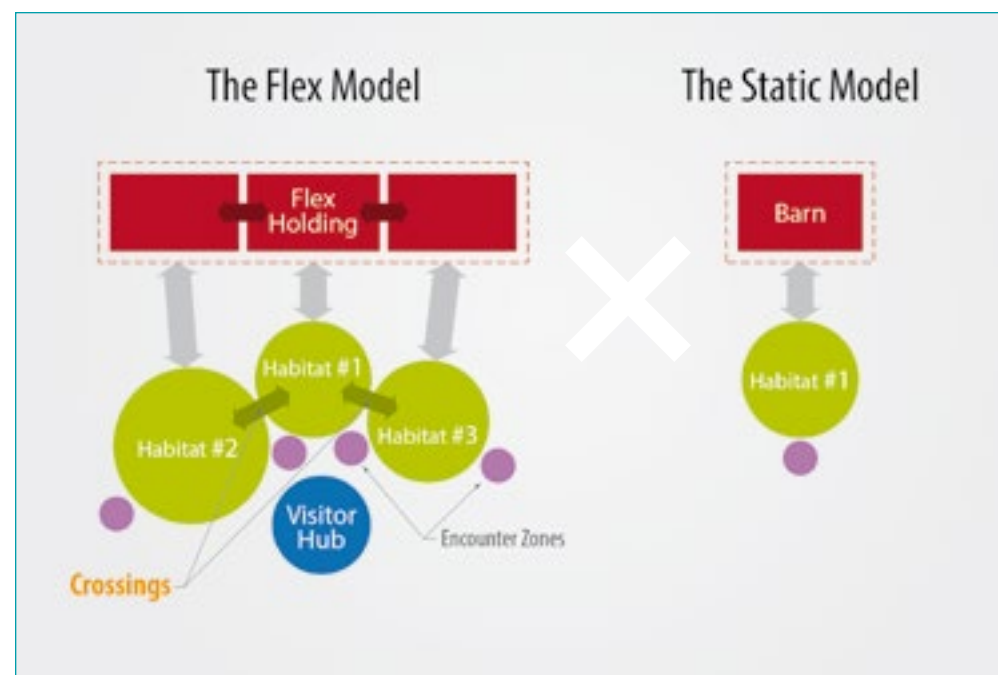
From the early 20th century onward to WAZA's recent Biodiversity is Us campaign and publication of *Committing to Conservation: The World Zoo and Aquarium Conservation Strategy*, we have had to acknowledge the loss of global biodiversity. Over the latter part of that same century up to the present, zoo exhibits have trended towards more and more enriching guest experiences to promote a strong message of zoo relevancy in light of dwindling numbers of species and shrinking wildlife habitats. For zoo designers this has followed many different design directions and approaches. This article presents three key design trends – flex, choice and passage.

## Introduction

In many respects, Heini Hediger's original vision and strong advocacy for quality of space over quantity of space is as fresh today as it was over 75 years ago and has been the premise behind the continued evolution of activity-based design.

Fundamental to our work at CLR Design has been the belief in continuing to advance the level of activity and engagement with the design of every new exhibit for the animals, staff and guests. The primary goal is to make a difference and ultimately affect positive change in the status of wild animal populations. The cliché still holds true today that the animals in our care are ambassadors for their wild counterparts and that as animal habitat designers it is our mission to help zoos inspire the public to care for each and every species and its continued existence.

Here, I briefly scratch the surface and look at three current trends that are creating more active animal exhibits through the design of specific strategies that look to model natural behavioural patterns for various animal species. These strategies are a part of the continuum of advancing and improving the missions of zoos. The general premise is to give animals more choice, activity and well-being in their exhibit environments. Three key design trends are presented below – flex, choice and passage.



© CLR Design Diagrams of flex model versus menagerie-style static model.

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© Denver Zoo

Elephant crossing bridge at Denver Zoo's Toyota Elephant Passage.

## Flex (or Rotation)

From the earlier days of landscape (habitat) immersion in the 1970s, zoo designers and animal management staff were beginning to understand that these beautiful exhibits with lovely views and overlooks seemed to be changing attitudes in guests – they felt better about the animals and their respective care and management. However, the animals were sometimes more difficult to see and often management styles did not change, so that the animals were not necessarily doing anything different and often were not very active.

In one response to this observation, Louisville Zoo's Islands (1996) was an exhibit concept that looked to "rotate" multiple species of animals through different habitats and management areas, allowing the animals multiple environments in which to move around and explore, and even mark their territory and engage olfactory and other senses.

Following Louisville Zoo, a couple of the next-generation concepts of rotation that we began calling *flex* (more flexibility and freedom to initiate new or adapt existing management styles) were Point Defiance Zoo & Aquarium's Asian Forest Sanctuary (2004) and Denver Zoo's Predator Ridge (2004). Of particular note with Point Defiance Zoo & Aquarium is that they both mix pairs of species such as otters and anoas and gibbons and tapirs, and rotate those pairs and another three to four species through five linked-up flex habitats, one indoor dayroom and a series of indoor holding spaces.

Predator Ridge followed in this continuum of evolution rotating lions, spotted hyenas and African wild dogs and added two feature demonstration areas at key intersections of the habitat circuit, enabling an even greater dynamic of guest experience as well as giving staff the direct ability to message to guests the importance and mission behind these activity-based exhibits.

Toyota Elephant Passage (2012), also at Denver Zoo, built on the successes of Predator Ridge. It is a much bigger site and different grouping of animals – elephants, tapirs and Indian rhinos – and it brings guests into the round by weaving the pathway through the middle of a ring of flex habitats, linked up with a bridge crossing and at-grade crossing that any of these three species can use.

A wonderful result of flex for not only the animals and guests is that staff are highly energised and motivated to work in these environments and enjoy planning out the choreography of animal training and movement each day. Denver Zoo staff years later have even adapted the holding suites at Predator Ridge with new linkages to allow for rotation of groups of animals within their bedroom night quarters.

It is worth noting that there certainly can be challenges with these types of exhibit complexes; therefore, the more zoos can share and learn from each other the better for the evolution of thinking and practice.





© CLR Design Oregon Zoo's Elephant Lands – flex, choice and passage.

## Choice

Elephant projects in Dublin, Chester and more recently Dallas, Oregon and Omaha zoos, to name a few, have pushed the envelope of design for choice with animal activity and elephants in particular. Dublin and Chester zoos have been some of the earlier animal managers to experiment with various strategies, including timed activity feeders that are now getting more use in Europe and the USA thanks to their initiative.

Multi-port feed walls have been successfully used with integrated timed feeders in all of these aforementioned zoos. However, because they have also created some consequences of elephants waiting around or monopolising the walls, there has been a continued push to develop more activity locations throughout the animals' environment. The recently opened Oregon Zoo's Elephant Lands (2016) set out to develop a greater array of choice and activity throughout the indoor and outdoor

habitats by increasing the number of and spreading out the timed feeding devices as well as the use of various types of hanging browse feeders. Just these strategies alone have led to much greater observable elephant movement throughout their habitats.

Other non-food based design elements have also been integrated into Elephant Lands, such as indoor rain systems, misting, water cannons, heated and wind break shelters, pools and sand throughout the indoor and outdoor habitats. Staff have actively managed the elephants by choreographing diverse sequences of planned and unplanned activity, ranging from demonstrations at scheduled times to sequences of movement initiated by pre-set combos of food and activity delivered via timed feeders, hot and cool zoning and water variability, to name a few. The habitats also have an elephant trail and other flex capabilities to link up various combinations of animal spaces for managing pairs or herd groups with multi-layered variety.

## Passage

The final type of activity-based design pattern presented here, *passage*, has evolved partly as a result of how flex habitats are linked up and partly as a vision driver to create linear spaces such as trails and longer narrower habitats that allow greater movement and distance away from a home-range habitat or holding facility.

Much has been written of late about Philadelphia Zoo360 and its unique implementation of passage on a campus-wide scale. This too has changed the way guests view and experience these animals and their habitats. Many guests arrive knowing about the premise behind Philadelphia Zoo360 and understand that they will have to look up, down and around more for the animals. In fact, the guests seem to react very positively to the perception and observation that the animals have more activity and choices.

Bridge and at-grade passage crossings for pachyderms at Denver and Cleveland zoos create opportunities for the animals as well as guests to engage positively in their environment through formal and informal



© CLR Design A passage at Philadelphia Zoo360.

## Conclusion

demonstrations at these locations. Just as often these are simply exciting locations to see the animals up close. So too, tiger trails at John Ball, Jacksonville and Philadelphia zoos are creating interesting circuits for the tigers to patrol, gain highpoints of elevation over guests and make choices.

It is worth briefly noting that designing these new types of habitats requires critical engagement of animal management staff and other stakeholders. It is not enough to design and build an exhibit (hardware) if the management approach (software) does not match up with it. Oregon Zoo's Elephant Lands began design with the main driver of animal choice and from there all things followed in response to that one idea. It can be that simple and yet does require a committed design process and high degree of stakeholder facilitation and exhibit variable testing and re-testing. Innovation is truly what can come forth and can be at the heart of bettering the lives of animals in a zoo setting.

While many design variables can certainly be subjective and unique to each institution's mission, we propose that activity-based design is a strong variable that should be considered in the total design of any exhibit complex. The successful result will still be measured by notions of place, theming, guest amenities, landscape, pathways, buildings for the public, buildings for the animals and staff and more, all while being woven into experiences of significance and impact. The key elements discussed here for consideration – flex, choice and passage – define a layer of characteristics that will along with the previous noted variables create a positive holistic result.

But key to all of it may in fact be the single most important element – have we succeeded in creating positive experiences for the animals and empowered our guests to care and make a difference? I believe we are on the right track and must continue to make a difference in the lives of the animals in our care and those that still exist in the wild. ■



Júlia Hanuliaková<sup>1,\*</sup>

# Wellness-inspired Design for Elephants

## Summary

The construct of “wellness” inspires new approaches to caring and designing for elephants in zoos, as I will illustrate with two case studies of recent elephant habitats. These habitats promote elephant wellness through innovative concepts such as natural existence within the herd, collaborative activities between visitors and elephants, and working with dynamic forces innate to the local living landscape. Defining wellness as a priority when programming a new habitat allows for an almost unlimited universe of options that lead to thriving elephants and people alike.

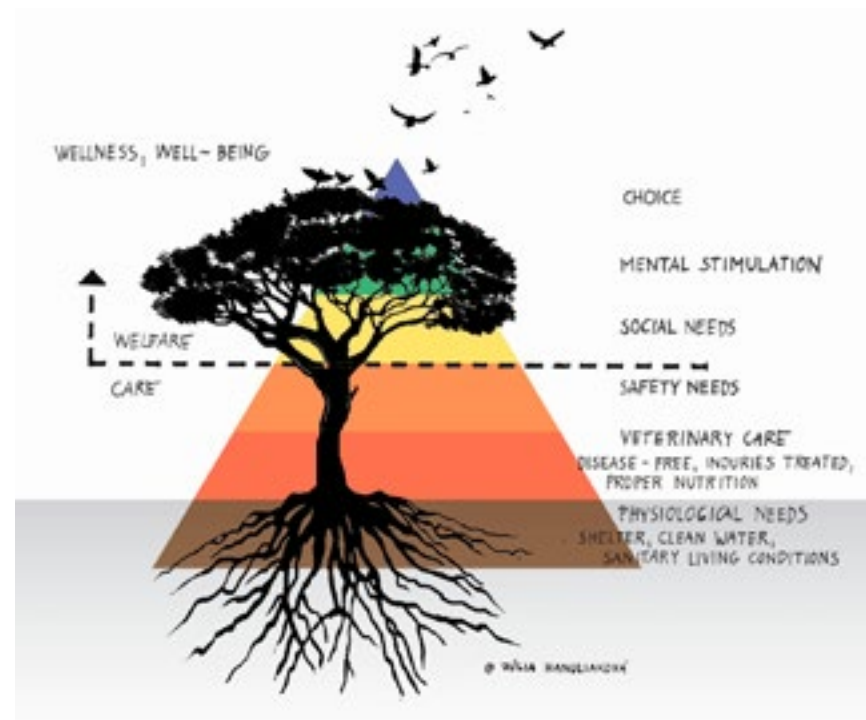
## Introduction

“Wellness” is a concept better understood as applied to the needs of humans. Maintaining a higher level of wellness is crucial to live a higher-quality life. Wellness matters because everything we do and every emotion we feel relates to our well-being. In turn, our well-being directly affects our actions and emotions. It is an ongoing circle. In achieving optimal wellness we subdue stress, reduce the risk of illness and ensure positive interactions.

We are familiar with an exhibit design approach similar to wellness known as “activity-based design”. Activity-based design is good, but we must go beyond measuring the welfare of animals by the amount of time they spend being active. The National

Wellness Institute defines wellness as “a conscious, self-directed and evolving process of achieving full potential”. Wellness is thus a self-activated category; it cannot be imposed on anyone. For both humans and elephants, being well is the result of choices and actions, a consequence of empowerment and self-esteem. It is more than being free of illnesses and well cared for, it is a dynamic process of change and growth that involves a sense of beauty, achievement, responsibility and personal fulfilment. There is no higher category of thriving than being well.

Following are two case studies of recent elephant habitats, each demonstrating original wellness-inspired solutions.



Maslow's hierarchy of needs applied to zoo animal welfare. © Júlia Hanuliaková

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© Patrick Bolger/Dublin Zoo

Three one-year-old elephant calves born at Dublin Zoo in 2014.

## Dublin Zoo – Kaziranga Forest Trail

With pools, dramatic rock formations and a waterfall, all surrounded by a dense forest of trees and bamboo, the Kaziranga Forest Trail at Dublin Zoo is a wonderful natural environment created with the needs of the elephants in mind. Opened in 2007 and with an outdoor area of 8,000 m<sup>2</sup>, the design was inspired by the wild home place of the elephants, and driven by an effort to restructure elephant management around natural biology and protected contact. Both the indoor and outdoor space features a minimum of 2 m of sand substrate that provides a varied, changeable surface – strengthening the elephants' muscle tone, wearing their feet soles and aiding their ability to rest leaning on mounds of sand. Caregivers remodel the outdoor habitat daily, by moving sand hills, burying food and water, planting rocks, stumps, bulldozing new hill topography, even planting forests of browse and vegetable gardens to be foraged by elephants. Although the outdoor area is not excessively large, all of this human effort creates

an interesting and dynamic environment for elephants. The entire habitat is bull-proof. The elephant group (currently consisting of nine animals) is monitored with cameras, and caregivers pride themselves in interacting minimally with the natural existence of the herd, including allowing for closely monitored yet unassisted births.

The tremendous success and popularity of the elephant habitat at Dublin Zoo illustrates that the concept of wellness changes the behaviour of caregivers even more than it changes the behaviour of animals. It makes the caregivers' jobs more meaningful, strengthening the bond between humans and animals. In the future, technology and sustainable habitats will free zoo staff of monotonous maintenance tasks and involve them in imagining and programming the daily lives of elephants. Instead of thinking simply of their feeding and cleaning duties, caregivers will think of how they can collaborate with the elephants to bring physical, social, emotional and mental well-being to the group.

## Zurich Zoo – Kaeng Krachan Elephant Park

Human–elephant coexistence is at the core of the Kaeng Krachan Elephant Park at Zurich Zoo, opened in 2014. The story of human–elephant conflict guides visitors upon approach to the main viewing opportunities where they encounter live fields of crops typical for Kaeng Krachan National Park, and the damage to farmers' fields and homes by elephants. The concept of living well with dangerous animals is repeated throughout the experience and allows visitors to empathise with the worries of people in Thailand, and is brought home to draw parallels with human–bear conflict in Switzerland.

Elephants (the group currently consists of eight animals) manage their daily lives by moving between a series of irregularly shaped yards nested in a hill side (11,000 m<sup>2</sup>) and indoor in a large elephant house (5,400 m<sup>2</sup>). The building, with its iconic turtle shell-like wooden roof, is an homage to the animal architecture by Heini Hediger and accommodates three expansive indoor habitats, holding areas, a 4.5 m deep underwater viewing pool, an elephant feeding station with view into the elephant's mouth and many other features for elephants and guests. Fifty-seven randomly timed feeders placed throughout the indoor and outdoor habitats encourage exploration. An outdoor amphitheatre features a water tower with a shower that requires a new level of interaction between elephants and visitors: visitors pump water into the elevated water tank, an elephant pulls a handle to make the shower run. No water in the tank means no shower; how does an elephant direct unsuspected guests to help out?





Elephant house at Zurich Zoo, with its iconic turtle shell-like wooden roof.

© Jean-Luc Grossmann/Zurich Zoo

## Trends in Designing for Elephants

Creating a destination for visitors, adding plenty of seating and opportunities to relax, increases chances of encounters with elephants in large habitats and as well as satisfaction of guests. Visitors appreciate the comfort, beauty and exotic character of the environment even if their encounter with animals is rarer than in a traditional exhibit display. The design aims for engagement of all senses, human and elephant alike, and auditory as well as olfactory and tactile impulses are important. Guests appreciate understanding that the resident elephants are well and enjoy understanding their role in the betterment of the elephants' lives. All habitats are bull-proof, providing for the possibility of hosting an all-male elephant group.

In a zoo setting, the concept of wellness for the resident animals is sometimes seen in competition with the need of creating a compelling visitor experience. We should challenge this general perception and build habitats that show excellent animal wellness in synergy with excellent visitor experiences. Habitats that are good for animals land credibility and authenticity to the institution and its message.

The table on the next page provides an overview of trends in designing for elephants that we are seeing worldwide. It highlights features that are fun for the visitors and contribute effectively to the care, welfare and wellness of the resident elephants.

## Future of Elephant Wellness

In March 2016, world elephant experts met at the first Elephant Wellness Workshop organised by Terry Maple and Tony Vecchio at Jacksonville Zoo and Gardens, and discussed the future of creating spaces that *let elephants be elephants*. Many opportunities arise from allowing zoo staff *to be inspired* by the concept of designing and managing not an exhibit, but the *psychological wellness of elephants*.

Here are some examples: (1) Climate-appropriate locations are important for a high-quality and sustainable natural life (birth, life and death). (2) Allow elephants to react to and interact with dynamic natural changes in their habitat – day-to-day, day-

Visitor experience	Elephant care, welfare and wellness
Landscape and cultural immersion and inversed landscape immersion support understanding of relationship between elephants and their natural habitat	Natural groups in habitats that replicate their home place, including natural surfaces (sand, mud), environmental challenge, enrichment features and vegetation
Story-telling explaining human–elephant coexistence or conflict empowers visitors to take action	Healthy zoo elephant ambassadors help wild conspecifics
Large complex habitats and dedicated, outside of habitat elephant paths (e.g. Elephant Trek at Cheyenne Mountain Zoo) allow for surprise encounters with elephants	Daily distance covered walking in habitat that is similar to daily walking distance in the wild
Borrowed views, mixed-species and rotational habitats create visual interest, complexity and richness	Interaction with others species and changing boundaries and conditions of habitat allow for stimulation and challenge
Extensive elephant houses designed as iconic structures bring conservation issues to attention of a large audience	Large controlled environment offers favourable environmental conditions in colder climates
Underwater viewing of elephants	Deep pools for swimming provide physical exercise and opportunities for social interaction in the water
Protected-contact animal care and enrichment explained bring insight into welfare of elephants, features that support interaction between visitors and elephants are popular	Progressive animal management, feeding and physical challenges, push, pull, stretch, strength and collaborative activities, promote elephant fitness and well-being
Web cameras allow for engagement of visitors with elephants, work of animal staff and researchers	Web cameras facilitate observation and protection of elephants
Visit of elephant area as a destination with plenty of seating and culinary opportunities, not a pass-through experience, increases stay-time	Events and human social activities could provide olfactory and auditory stimulation for elephants
Bachelor group allows visitors to observe unique dynamics of an all-male herd	Living and interacting in a natural social group other than the family herd, mentoring amongst males

## Conclusion

to-night, seasonal and annual. (3) Program tasks that support social interaction. Plan for the needs of bachelor groups as well as of family herds. (4) Create a plan for a regional herd and migration of elephants. Plan for annual migration events, perhaps to choose mates or visit burial sites.

We are just starting to understand how to work with the myriad of possibilities that technology brings to improve animal care and welfare, and how it can contribute to self-activated wellness of elephants. Here are some ideas: (1) Drones to deliver food and intellectual challenge to elephants. (2) Automated systems allow for choice, chance, surprise, success and failure of elephants in their habitats. (3) Microchips worn by elephants to individualise personal challenge and access of elephants to different parts of their habitat.

Attentive animal management, along with well-designed space, can do much to enhance the fitness, health and well-being of its inhabitants. Equally, it can create an aesthetic experience for visitors where they can observe animals as fully sentient, story-telling partners in landscapes that demonstrate a rich variety of choices and a complex repertoire of behaviours that arise from an animal's own curiosity and its use of the habitat.

The path to improvement and innovation does not lie in copying other institutions but rather in studying nature, and much inspiration can be found by using the concept of psychological wellness as a guiding principle. Working with the construct of wellness inspires zoo staff to imagine

a better programming, which then results in original design solutions and management styles that lead to thriving elephants and people. Wellness as a priority opens up a world of possibilities; each institution can prioritise the ones that really count and are achievable in the reality of their zoo, choosing qualities that are already present in their natural landscape as well as in talents and abilities of their people and elephants. Innovation is not necessarily more expensive, but good outcomes require thoughtful, thorough and brave ideas, and bold effort. ■



Ray Hole<sup>1,\*</sup>

# Land of Lions at ZSL London Zoo

## Summary

In March 2016, HRH the Queen opened ZSL London Zoo's new Asiatic lion experience. This 8,000 m<sup>2</sup> mixed-species exhibit creates a multi-levelled, richly interpretive environment taking visitors on a journey through a sequence of Indian inspired landscapes and settings – encountering lions, primates and other associated species in unfamiliar, yet “authentic” situations. The integrated and enriching animal conservation environment also aims to experientially engage the visitors, increasing awareness and bring into sharp focus the realities facing this endangered subspecies and the local Gujarati community that share the same space and resources. In addition, and something quite unique for ZSL London Zoo – luxury accommodation is incorporated, allowing guests to enjoy an overnight stay immersed within the lions' exhibit itself. This article explains the approach taken from establishing the aims and objectives, through the design development, implementation and operational stages of the project.

## Background

In 2013, ZSL London Zoo commissioned Ray Hole Architects to design a new Asiatic lion experience. Considering the “long-term” viability of the enclosure was key to the project and augmenting the existing “assets” with new and spatially recalibrated environments for the animals was paramount to the strategic approach.

This 8,000 m<sup>2</sup> exhibit (opened by HRH the Queen in March 2016) creates a multi-levelled, richly interpretive environment taking visitors on an experiential journey through a sequence of urban, suburban and rural Indian (Gujarati) inspired landscapes and settings – encountering lions, primates and other associated species in unfamiliar, yet “authentic” situations. The overriding purpose of this new exhibit is that it becomes a fundamental part of ZSL's mission – aimed not only at bringing increased awareness to the ongoing plight of the last stronghold population of this endangered subspecies (estimated to be 523 animals in 2015), but also to form part of a regional breeding programme, dedicated to growing a genetically healthy and thriving captive population.

Although welcomed, the small increase in the wild population, predominantly located in India's Gir Forest (and recognised by a recent status change from critically endangered to endangered) could lead to undesirable consequences in this increasingly human-dominated landscape. A disease epidemic or natural disaster poses a significant threat to the population, as does increasing contact with humans in villages less accustomed to their presence. Therefore, the project's strategic brief demanded an integrated and enriching animal welfare and conservation environment, which would experientially engage and transform existing and future visitors.

## Towards a Project Strategic Brief

These local realities, with the daily challenges of human and threatened species coexistence, combined with the ubiquitous global pressure on limited habitat and natural resources, provided an extraordinary array of possibilities in conservation story-telling, stage setting and multi-sensory engagement mediums for the visitors – whilst creating a varied canvas of environments for the lions and the other incorporated species.

Our starting point was to assemble and (re)define a new project site by merging a number of existing animal environments (internal/external), landscapes, infrastructure, visitor circulation routes and amenities. We wanted to exploit these existing “assets” as an integral part of the new exhibit – reinforcing our practice's philosophy of reduce, re-use and recycle – but which helps to reduce capital expenditure and operating costs also. In addition, we wanted to exploit existing building facades as new enclosure boundaries whilst providing expanded and diverse vistas from within and beyond the new exhibit across the adjacent landscapes – including the surrounding Regent's Park.

Significantly increasing the scale of the exhibit satisfies another of our practice's principles of (re)calibrating the balance of space shared by the animals, visitors and operational team – increasing the density and variety of animal-to-visitor engagement whilst providing the maximum space for the animals, allowing them free choice of location and movement within the exhibit. Furthermore, creating environments where both visitors and animals appear to be within the same space (at either the same or differing level) brings additional experiential value and sensory awakening.



© Ray Hole Architects

Varied landscapes provide contrasting environments for the lions and visitors.

## Defining a Project Strategic Brief

Within the new project site boundary, the strategic brief required four principal animal environments: Asiatic lions (occupying two contrasting environments); Hanuman langurs (occupying two interconnected areas); vultures; and a number of other species (flamingo, mongoose and muntjac). And five visitor environments: village and suburban high street; dilapidated fort; railway station and railway bridge; Ginnar Hills and riverside trail; and lion temple. In addition, a luxury accommodation experience had to be incorporated – something quite unique for ZSL London Zoo – where guests can enjoy an overnight stay immersed within the lions' exhibit itself.

The programme indicated a total of 18 months from inception through to opening, which had to incorporate design development, permissions (including planning and stakeholder approvals), relocation of species, site assembly, demolition and enabling works, construction (building and interpretation) and animal reintroduction. The project budget also had to continually reflect the initial ambition, site and construction industry constraints – but also a number of opportunities that emerged during the design and implementation process.

## Design and Implementation Process

Ray Hole Architects have developed a number of design development tools (applicable to all visitor attraction types) in order to assist the collaborative project team (client, design and implementation) to arrive at an experientially balanced solution primarily aimed at creating increased awareness and anticipation, extending dwell-time, instilling life-transforming memories and behaviour change, and encouraging repeat visitation.

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© Ray Hole Architects

The vertically tensioned cable barrier between the lions and visitors visually "disappears".

### Realisation

By synthesising combinations of primary experiential environments (aesthetic, discovery and learning, escapism and entertainment) – with the possibility of active or passive participation and connected by absorptive or immersive environmental relationships – a spatial masterplan will emerge that can facilitate the delivery of an enhanced experience for both animals and visitors. Overlaying a compelling storyline that knits together both visitor and animal environments and which activates all the senses completes the concept master planning process. The implementation process involved a hybrid of main contractor with specialist thematic subcontractor, in addition to interpretation expertise provided by ZSL's in-house team.

The "anchor experiences" comprise the 360 degree lion temple and Sasan Gir railway platform encounters, supported by an array of other experiences as highlighted above. Both distinctively different settings stage exciting opportunities for animal-to-visitor proximity – creating the illusion of a no-barrier environment. The 360 degree envelope uniquely utilises 5 m high tensioned, vertical cables that "disappear" when focussing on the lions, whereas the railway platform uses the familiar integrated transparent glazing technique positioned on the centreline of the platform. Both rely on the continuation of the themed landscape and built environment to reinforce the illusion of shared territory.

Because of the increased scale of the lions' environment, numerous and varied encounters have been created: a day den has been modelled from a family home where lions have invaded the back yard; the original lion exhibit water feature has been (re)contextualised to create a river edge between lions and visitors; elevated views into the Gir Forest are given from the railway bridge; and the Gimar Hills overhead walkway trail provides glimpses at different levels as the thematic access ramp meanders down to the riverside level. Additional lion encounters also occur through the peripheral railway goods yard fencing looking across the mongoose enclosure.

The elevated railway bridge is fundamental in providing high-level vantage points along its length into both lion and primate enclosures. Incorporating lift and stairs into the thematic architecture and interpretive props creates a central vertical circulation point, providing access for all to the upper level experiences.

Similarly, a thematically integrated "bamboo work platform" inspired ramp gives access up onto the fort roof from the village. This ramp also provides multi-level viewing points into one half of the primate enclosure. The upper level of the fort provides the other observation platform, in addition to views into a glazed roof-top "kiosk" accommodating the primates' day gym. Other primate encounters occur within the railway station, village and high street, where the "mischievous" langurs occupy one of the shops.

Discovery and learning opportunities are facilitated across the whole exhibit; however, the centralised classroom occupies a prime location within the railway station compound, allowing close proximity to both lions and primates. Other segregated viewing areas are also provided in this location, providing additional education, keeper or VIP encounter opportunities.



© Ray Hole Architects

Integrated glazing and shared landscape reinforce the platform illusion.



© Ray Hole Architects

A multi-level ramp provides visitors varied viewing points into the primate enclosure.

### Conclusion

From the initial briefing to the official opening, this project has thrown the collective client, design and implementation team a number of anticipated and unforeseen challenges and opportunities in equal measure. The end result is testament to the collaborative working approach and spirit that is fundamental to the success of any project. As lead designer, Ray Hole Architects are very proud to have been given the task to deliver such an important opportunity. We believe that this sets a number of new benchmarks and sits comfortably within the lineage of zoo master planning and architecture at ZSL London Zoo. ■



Becca Hanson<sup>1,\*</sup> & Monica Lake<sup>2</sup>

# Woodland Park Zoo's Banyan Wilds: Conservation and Connection with Asia's Malayan Tigers and Sloth Bears

## Summary

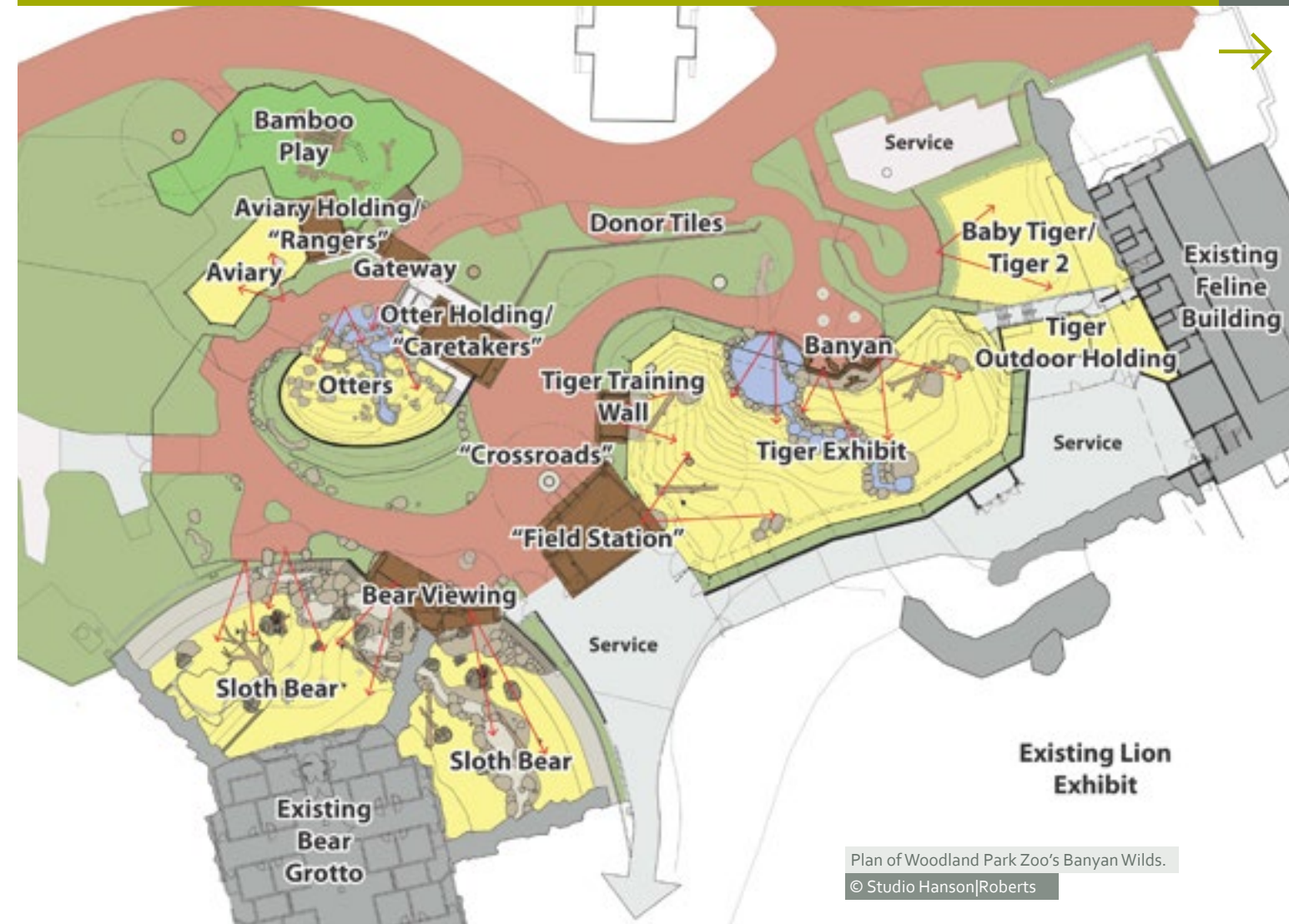
Today's zoos are faced with the very real dilemma of deciding what facilities to save and renovate, and what needs to be rebuilt from scratch, as we continue to gain a better understanding of animal welfare requirements and visitor learning modalities. This article outlines Woodland Park Zoo's decisions regarding their newest exhibit, Banyan Wilds, opened in May 2015.

## Introduction

In 1949, plans were drawn up to create new and expansive big cat and bear grottoes in the heart of the City of Seattle's Parks and Recreation facility at Woodland Park Zoo. Over the ensuing 65 years, these facilities served as homes for successive groups of lions, tigers and pumas as well as black bears, sun bears and sloth bears, as the world of zoos and the fate of the world's wildlife changed at warp speed. Over that same time, incremental changes were made to the existing grottoes that resulted in modest renovations and portions being carved out to create precedent-setting immersive habitats for lions and gorillas. The rest of the grottoes, however, remained more or less as they had been designed in the 1950s.

In 2011, Woodland Park Zoo, now a private non-profit conservation organisation, began planning a project to redevelop the area around two grottoes as an immersive Asian zone that focused on the care, display and conservation of Malayan tigers and sloth bears. Neither of these two animals share the same biogeographical setting; nevertheless, they do come from similar forest-type habitats that are affected by similar anthropogenic threats: continued forest clearing for macro-agriculture ranging from tea to oil palm plantations, habitat fragmentation, continued killing and changing food source availability. Thus, a story could be developed that linked these animals together by virtue of the conservation work that is being done *in situ* and *ex situ* to support these animals and their habitats.

The goal, from a sustainability point of view, was to reuse as much of the existing back-of-grotto housing as possible, and to expand and replace the rest with landscape-based facilities. The design for the new facilities would use an understanding of animal behaviour and ecology as well as informal public education and community engagement strategies, and a strong storyline to produce a place of great beauty that meets the long-term needs of Woodland Park Zoo, its animals, staff and visitors.



Plan of Woodland Park Zoo's Banyan Wilds.  
© Studio Hanson|Roberts

## The Exhibit

The result produces a carefully choreographed "journey of encounters" that is designed to both engage visitors' curiosity and increase empathy for and understanding of the role of carnivores and large mammals in the health and well-being of natural ecosystems, as well as to increase awareness of the anthropogenic threats that these animals must deal with. In addition, it performs a very simple but important functional task for Woodland Park Zoo as a whole by creating a more flexible, safer circulation system that provides (1) a new centralised public pathway that bisects the zoo's existing single-loop circulation system and (2) a new non-public service access to the existing big cat facility.

The Banyan Wilds' setting takes the form of a "nature reserve" that transcends the boundary between primary forest and logged land being prepared for agriculture. It portrays rangers and scientists and Woodland Park Zoo's on-the-ground conservation work, and provides spaces for the visiting public who are interested in viewing *wildlife* and understanding the conservation work that goes on in the "nature reserve". The key features of the exhibit include:

**Entry to the Reserve:** Visitors pass by the Gatekeeper's Cottage and the children's Bamboo Play Space as they enter the forested world of Banyan Wilds. Immediately beyond the Entry Gateway, which marks the beginning of the journey, visitors are welcomed by an extensive family of Asian small-clawed otters.

**Face-to-Face with Sloth Bears:** Monolithic rock formations, reminiscent of the sloth bears' natural range, welcome visitors into their world where the bears can be observed lounging on a log or searching for honey. In the summer season, visitors can join a keeper for interactive feedings where the bears demonstrate their unique "vacuuming" capabilities that assure them of a steady food supply when feeding on ants and termites (see <https://www.youtube.com/watch?v=c-oqU-laixM>). Careful listening enables visitors to tune into an acoustic system that picks up the smallest sounds of the bears and transmits them via the glass window wall to the public standing on the other side – literally bringing the bears alive visually *and* acoustically.

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→ In the *Field House*, visitors encounter signs of field biologists and conservation rangers, including maps and tools of the trade. They learn that these conservation heroes are supported by Woodland Park Zoo and need the help of visitors. Audio, video and touchscreen interactives turn this space into a conservation action centre, bringing to life the stories of those who protect the forest, and inviting visitors to become part of Woodland Park Zoo's digitally connected "Tiger Team" while they peer out the window and into the eyes of a tiger immediately outside.

*Caring for Tigers:* At a crossroads, visitors come across a forest gate. Tire treads and wildlife tracks show that this is an old gate used for logging and transport of forest products. Daily summer programmes are delivered at the gateway here, where visitors can get up-close to tigers as keepers work one-on-one with the animals to demonstrate how Woodland Park Zoo cares for these magnificent cats.

*Forest at a Crossroads:* Adjacent to the crossroads is the Caretaker's Place. It is an area that feels more built-up and open with a potted palm nursery that stands at the ready for future planting. Here, visitors learn more about why Woodland Park Zoo supports certified sustainable palm oil that is deforestation free.

*Get Close. Get Wowed!* Tiger activities – including cooling in a pool; pushing and scratching enrichment trees in pursuit of sequestered food items; prowling through the bamboo forest; or napping under the shade of an ancient banyan tree – are all part of the final choreography of the experience. The banyan tree, with its intertwining roots, bridges the divide between visitors and tigers, creating an intimate space where acoustic enhancements allow visitors to hear the tigers' softest purrs, breaths and woofs, as well as their ultimate form of communication: the deep-throated roar that differentiates a "great" cat from the rest of its felid relatives.

*Feline Family Life:* The individual personalities of the current trio of tiger brothers resident at Woodland Park Zoo have allowed them to remain on



© Ryan Hawk  
Bamboo Play Space.

exhibit together. However, should the need arise, expanded outdoor enclosures and an outdoor "baby tiger" maternity yard provide management flexibility for various family scenarios in the future, ensuring that all animals can be safely managed and have both outdoor and indoor access at all times. The "baby tiger" area has additional flexibility designed into its layout to allow for supervised visitor viewing of cubs once they are old enough to be on limited view with their mother.

*Honouring the Community:* Artist-designed, handmade tiles line a forest path immediately outside the exhibit, saying thank you to the many people who donated to the construction of the exhibit.

## Conclusion

The final result seamlessly combines the renovated back-of-house spaces of the pre-existing taxonomic grottoes with expansive new landscapes for Malayan tigers and sloth bears. These landscapes are experientially linked together in ways that provide respectful up-close encounters with the animals, and enable Woodland Park Zoo to tell compelling stories that can be easily updated as new conservation information comes in from the field. ■



© Ryan Hawk Sloth bears.



© Ryan Hawk Tiger siblings.



Patrick Janikowski<sup>1\*</sup>, James Brighton<sup>1</sup>, Joyce Lee<sup>1</sup> & Terry O'Connor<sup>1</sup>

# A Playground in Nature: Longsha Zoological and Botanical Garden in China

## Summary

Most of us went to a zoo at some point in our childhoods. In the earlier days, the animals were often exhibited behind metal bars, in small cages, barren of any furnishings. The exhibits felt like specimen boxes with visitors simply looking at the animals. Even today, visitors still experience this in some zoos. Within the last decade, a vast array of zoos, aquariums and safari parks have sprung up throughout China, estimated at more than 200 according to the Chinese Association of Zoological Gardens. With a growing affluent population, how does a new zoo capitalise on this potential and set an example for all future zoos? This article outlines the design of Longsha Zoological and Botanical Garden in China.

## Introduction

Longsha Zoological and Botanical Garden is a new park that opened in June 2014, located just beyond the downtown core of Qiqihar. With a population of five million, it is the second largest city in the north-eastern province of Heilongjiang. Built on former agricultural and aquacultural land, the 32 ha park has become a trendsetter for zoo design in China. The design was founded upon international standards for animal care and welfare, natural science education and interpretation, and visitor interactivity and entertainment. All animal holding, management and exhibit spaces were designed to meet or exceed the standards established by AZA and EAZA. The park's exhibit and interactive displays are bi-lingual in Mandarin Chinese and English. The wayfinding signs use four languages: Mandarin, English, Japanese and Korean.

The project set a challenge for the design team: create an interactive experience that connects visitors with animals in a natural setting that is fun, educational and promotes multi-generational communication. The approach to the physical layout was to merge the interpretive content into the exhibits. Interactive elements were strategically located within each zone. The conservation and educational messages are integrated with, not additive to, the animal viewing. The overall design results in a broad-ranged and meaningful experience that instils empathy for nature and wild animals.

## How Do Visitors Experience the Zoo?

The physical organisation of the park was designed to provide distinct habitats that simulate the earth's biomes and other geographical zones, wherein plants, animals and interpretive elements are integrated to bring the visitors multi-layered and unexpected connections both within and outside of the local region.

*Local climatic imperatives:* At latitude 47° N, the seasonal temperatures swing from low -40 °C to high 30 °C, dictating the need for interior and exterior animal and visitor spaces. Most animal species have generously sized outdoor and indoor enclosures. Outdoor exhibits use solar orientation to create micro-habitats. Large, free-range, mixed-species habitats allow herd animals the freedom of movement. Indoor habitats provide ample visitor viewing and animal comfort during the long winter months, achieved through the use of geothermal in-floor heating, skylights for natural daylighting and solar gain, and enrichment elements such as hot and cool rocks, feeders and drinkers.

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龙沙动植物园  
LONGSHA ZOOLOGICAL & BOTANICAL GARDEN  
QIQIHAR, P.R. CHINA



The new park offers generous outdoor and indoor animal exhibits to bridge the mild summer and severe winter.

© PJA





A bi-lingual story sign marks each exhibit entry to prepare the visitors for the experience beyond.

**Habitat zones:** Animals are exhibited in their natural habitats, simulating specific biomes such as wetlands, grasslands, temperate forest and tropical rainforest. Plants are selected to mimic the natural environment found in each biome and can be sourced easily from local nurseries. Interpretive signs explain the biomes, each with a world classification map, graphics, images and text of the associated plants and animals.

**Geographical links:** Thematic elements are designed to immerse visitors in the natural and cultural surroundings of Asia, Australia, North America, northern Europe and Africa. Regional character and context are reinforced through visual cues, such as artificial geological formations and human elements in architecture, arts and crafts. For example, visitor viewing shelters take on the look of vernacular architecture found near the animals' native habitats. These elements accentuate and enrich a visitor's connection within each zone.

**Conservation actions:** Expressed through interpretive graphics for each biome and animal, conservation messages raise awareness of local, regional and worldwide issues, and inspire visitors to take specific actions. For example, one entire exhibit zone is dedicated to global wetland bird species, as Qiqihar is known as the "Crane City" for its proximity to Zhalong Nature Reserve. This wetland is home to six of the 15 crane species, including the endangered red-crowned crane. Of the 2,000 remaining birds worldwide, 400 return here to nest every year.



Visitors explore how a mother kangaroo cares for the baby joey.

© PJA

*Play-based elements* elaborate on the story concepts to encourage family interaction and provide opportunities for children to explore animal habitats and mimic animal behaviours. Some examples include:

- **Kangaroo Pouch:** Visitors pop up from the oversized pouch to experience how a mother kangaroo cares for the baby joey. And it is a perfect opportunity for a photo!
- **Hibernation Cave:** Children crawl in the cave to find life-sized animal sculptures and discover how they conserve energy by sleeping and slowing their heart rate and breathing when food is unavailable.

In addition, Texas Farm is a dedicated area that highlights how humans live with and care for animals, and how we manipulate nature for our survival. Upon meeting a variety of domesticated animals, children milk a cow, climb on farm animal sculptures and straw bales, and play on farming equipment, such as a corn crib, a tractor and a windmill.

The Discovery Centre is an indoor venue of 16 non-animal interactive exhibits that illustrate "animal culture" among various animal species, conspecifics and humans. Visitors explore three major storylines:

- **Animal Symbiosis:** "Unlikely Partners" uses activities to show how seemingly unrelated species cooperate for mutual benefit, such as dung beetle and elephant.
- **Animal Architecture:** "Making Structure" enables visitors to explore shelters that animals and people build to raise their young, store food and provide security and comfort. Examples include a human igloo and weaver bird nests.
- **Animal Society:** "Living Together" compares solitary animals (giant panda), social groups (dolphin pod), pairs (cranes), family units (gibbons) and social insects (bee colony).

### What Do Visitors Take away from the Zoo?

Our design intent was to guide visitors' interaction through multi-sensory activities whenever possible. Transitioning from one zone to the next, visitors *read* text and graphics that illustrate each biome, describe plant characteristics and highlight conservation issues. Upon entering the exhibits, large story and animal identification signs focus visitors' attention to *observe* animals closely and *see* their physical adaptations and behaviours. Within each zone, interactive elements encourage the visitors to *touch, do* and *play*.

*Story concepts* are based on the following categories: adaptation to environmental and climatic conditions, migration to obtain sustainable food sources, animal reproduction and care of young, domestication and food production, and communication and intelligence as survival strategies. Specific topics for each zone include:

- The Hunters illustrates predator strategies of hunting prey, alone or in groups, and use of speed, stamina and stalking.
- Animal Parents discusses different breeding and rearing strategies including single *versus* multiple offspring.





Children play a game of "dung balls" through the air tubes and into the dung beetle burrows. © PJA

### Conclusion

Throughout the park, visitors are immersed in thematically relevant surroundings, and engaged in activities directly tied to the biomes and animals. The educational messages are conveyed through multi-sensory experiences, and the play opportunities are purposely and conveniently placed for children to not only burn off energy but also learn about nature. The take-away is a greater personal connection and deeper respect for animals and the environment.

With its burgeoning middle class, increased leisure time and public interest in wild animals, China is a fertile ground for advancing the ideas of a modern zoo. Longsha Zoological and Botanical Garden has set new standards in order to offer a multi-dimensional experience, encourage visitor interactivity, stimulate communication among families and impart knowledge of animals and plants, all in an attractive and comfortable environment. It is a testament to a client group willing to challenge cultural norms, cater to visitor needs and consumer demands, and significantly redefine the meaning of a zoo.

The park has seen steady attendance increases, even during the winter months when bone-chilling temperatures generally limit visitation. The park has been granted a 4A class tourism rating from the central government Bureau of Tourism. The city of Qiqihar also supports the new zoo through expanded tourism programmes and transportation improvements, which attract visitors from the vicinity of a two-hour drive. Longsha Zoological and Botanical Garden has bridged a tourism gap in this industrial city, and will continue to serve as a fun, entertaining and educational destination for generations to come. ■

Monika Fiby<sup>1,\*</sup>

## ZooLex by the Numbers

### Summary

ZooLex is a valuable resource for zoo professionals around the world. This article presents some key performance indicators from the ZooLex database and evaluates how ZooLex is being used, who the presenters are and which types of exhibits they submit. We are pointing to exhibits that we believe exemplify conservation, animal welfare and education best and may be models for the future. The presentation of these exhibits may have an influence on zoo design trends.

### ZooLex and its Use

For 15 years, ZooLex has presented animal exhibits from around the world for free (see <http://www.zoolex.org>) – since 2003 as a WAZA service. The purpose – according to the mission of the non-profit ZooLex Zoo Design Organisation – is to help improve holding conditions for wild animals in human care by: publishing and disseminating information related to zoo design; promoting appropriate holding conditions for wild animals in human care; providing balanced technical information and advice about zoo design; and supporting research and vocational training related to zoo design.

We count a monthly average of 32,000 single visits, 220,000 page views and 1,100,000 hits to the ZooLex website. The monthly ZooLex newsletter announces new exhibit presentations. About 6,000 subscribers and thus regular ZooLex users can be recognised by their e-mail addresses. Most addresses relate to zoos.

From feedback (see testimonials on the ZooLex website), personal communication with designers and zoo staff worldwide, and from my own experience as a zoo designer, we found how ZooLex has become a standard resource for exhibit designers, whether they are architects, curators, educators or keepers. ZooLex helps zoo staff get inspired and allows them to use examples from the Gallery for their own exhibit developments. Costs and sizes of exhibits that are published on ZooLex indicate funding and space requirements for master planning and exhibit developing purposes. Photos included on ZooLex exhibit presentations are used in project briefs to illustrate and exemplify the desirable style or specific features of a design. Zoo staff and designers defend their ideas by using ZooLex as a reference. Photos from ZooLex are also used as models by fabricators.



Monika Fiby working with a client.

© Monika Fiby

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## Publishing Policies

From 2000 to 2015, ZooLex has presented 204 animal exhibits from around the world. All of them are approved by the institution hosting the exhibit and by the ZooLex editorial board. Publishing is in English, but more than half of the presentations are additionally published in German or Spanish.

ZooLex only publishes presentations that show the whole picture of an exhibit, including animal management facilities. Apart from this rule, all exhibits are eligible for presentation. We do not publish judgements and personal opinions, but we use a standard format for describing exhibits. This format helps the reader to judge the quality of an exhibit by the quality of its presentation.

## Owners and Presenters

WAZA members constitute 67 of the 104 institutions that have published on ZooLex so far. Language barriers for sure matter. While we have helped many zoos in German-speaking countries to get their exhibits on ZooLex, zoos from English-speaking countries clearly have an advantage in publishing. This has resulted in 28 institutions from German-speaking countries publishing on ZooLex, in comparison to 32 from other countries in Europe. Institutions from English-speaking countries (USA, UK, Australia, New Zealand, Singapore) represent almost half (50) of all ZooLex presenters.

There are obviously well-known zoos that people want to see. Exhibit presentations from Bronx, Zurich and Chester zoos are among those that receive the most visits, as indicated by the counter at the end of each presentation. These three zoos are at the same time among the institutions that have shared the most exhibits (four to seven each). Woodland Park, Vienna and Zurich zoos were the first supporters of ZooLex. As a consequence, they are also well represented on ZooLex, with four to nine exhibits each.



© Monika Fiby

See on ZooLex how jellyfish are exhibited as Living Art at Monterey Bay Aquarium.

## ZooLex Gallery

We have been evaluating which types of exhibits can be found on ZooLex so far. The data clearly show a bias towards the big charismatic species: exhibits for big cats (26), apes (20), bears (19) and elephants (nine) are the most numerous among various types of exhibits on ZooLex. Out of a total of 204 exhibit presentations, only four are aquariums. These four were presented by the National Aquarium Baltimore and Monterey Bay Aquarium and prepared from AZA award submissions.

Besides various otter species (nine), almost no mustelid exhibits are presented on ZooLex, but they are rare in zoos as well. Red pandas are quite popular in zoos and on ZooLex too (four). Two exhibits in the Gallery are dedicated to insects, namely bees and butterflies. We hope that they will serve as good examples for more insect exhibit presentations. Birds (24) are well represented on ZooLex, with the most numerous exhibits being for penguins (five).

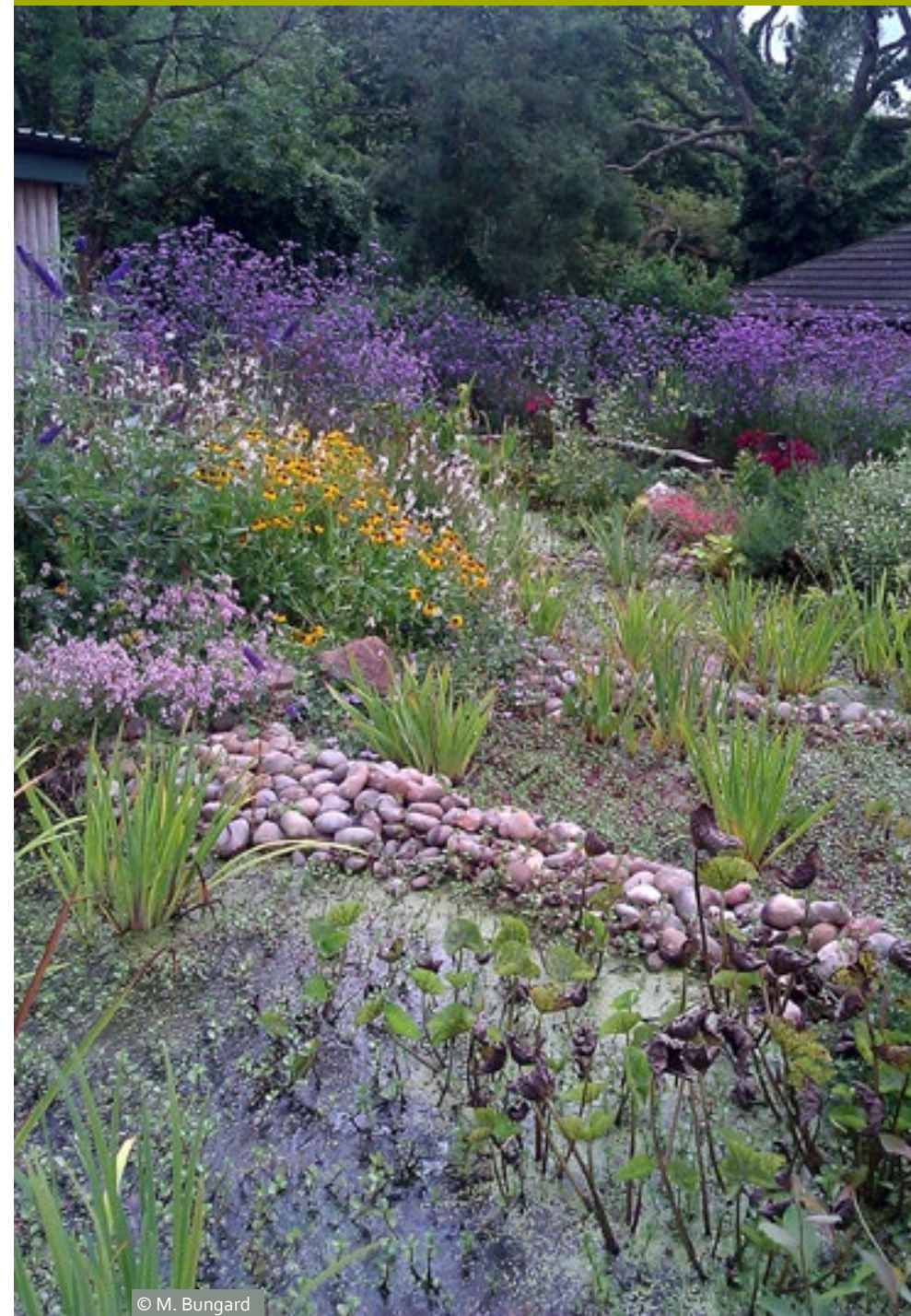


## Role Models

What will be the direction of zoo design on a global scale in the future? The visitor counters on ZooLex show that the most frequently visited presentations illustrate exhibits for big charismatic species and large sophisticated theme areas, such as Congo Gorilla Forest (Bronx Zoo), Elephants of the Asian Forest (Chester Zoo), Manatee Springs (Cincinnati Zoo & Botanical Garden), Masoala Rainforest (Zurich Zoo) and Tiger Lair and Tiger Base Camp (Minnesota Zoo). This seems to mirror the interest of decision-makers and the public on ZooLex as well as in the real world where big openings draw big audiences.

Flexible facilities for managing large groups of animals may become more important in the future. After having gone from the historic taxonomic menagerie through geographic collections to habitat design, we may see new taxonomic theme areas because they are effective for breeding species of the same taxon. Examples on ZooLex include Nordic Owl Aviaries (Ostrava Zoo), Amphibian Ark (Paignton Zoo), African Ungulate Conservation Centre (Woburn Safari Park) and Mink-Ferret Rotation Exhibit (Fasanerie Wiesbaden).

Native species exhibits have a great potential for serving conservation, animal welfare and education in a sustainable way. If located in an interesting site, the landscape design can make use of existing habitats, such as Wolf Territory (Highland Wildlife Park), Bearded Vulture Aviary (Tierpark Goldau) and Wetlands Aviary (Healesville Sanctuary). Native animal parks are cost effective when making good use of their site and serving the regional population. Interesting themes make them stand out and attractive for tourists. The Arizona Sonora Desert Museum, Alpenzoo Innsbruck and Otter Centre Hankensbüttel, for example, are represented in the Gallery.



© M. Bungard

Taxonomic exhibits may facilitate breeding – see Paignton Zoo's Amphibian Ark and its wildlife garden on ZooLex.

In general, we try to present exhibits from theme areas separately for each species with a common introduction, in order to show how each exhibit was designed for the species it accommodates. Examples include Asia Trail (Smithsonian National Zoological Park), Himalayas (Zurich Zoo), Masai Mara (Zoo Atlanta), Russia's

Grizzly Coast (Minnesota Zoo) and Pongoland (Leipzig Zoo). Sometimes this is not possible because we cannot obtain enough details. Overall, 26 theme areas are on ZooLex, seven thereof are rainforest exhibitions.







© Vienna Zoo/Daniel Zupanc

Exhibition of bees at Vienna Zoo presented on ZooLex.

### Pointing to the Future

When integrated into traditional zoos, native species exhibits need a special wow factor to be attractive among elephants and tigers. Creatures of the Wollemi (Taronga Zoo) is a large exhibit with a mix of various species and a special story. Nature Experience Walk (Vienna Zoo) is an exhibition of free-range and captive native animals in a managed part of the local forest. The highlight of the exhibition is a view of Vienna from a giant hanging bridge. We will show more examples of free-range and captive native animal displays, for example in the Bavarian Forest National Park, on ZooLex in the future.

Tigers at Ranthambore (Ranthambore National Park) is an example of how the differences between a zoo and the wild may blur in the future, when we have to manage the last specimens of large species in fragmented pieces of land.

Since ZooLex helps zoo staff and designers to develop exhibits, ZooLex has an influence on design. ZooLex content is shaped by ZooLex editors who approve all submissions for publication and actively invite contributors.

Most presentations published on ZooLex (141 of 204) were initiated by us and our editors, particularly during the first years. Meanwhile more zoos and designers have found their way to submit presentations, usually of newly built facilities. AZA award submissions are easy to get onto ZooLex. Their format is very similar to ours. Submissions by zoos and designers tend to cover theme areas and exhibits for big and charismatic species. These presentations are appreci-

ated because they can help others improve holding conditions and save money at the same time. ZooLex editors diversify the Gallery by helping to present exhibits for species that are rarely kept or considered difficult or not worthwhile to exhibit.

Preparing a presentation from scratch seems time consuming, but is an interesting task for interns or students. They can use the ZooLex template, take photos and make interviews on site, and look for a plan or draw a sketch of the exhibit layout to scale. Preparing a presentation for the Gallery is a rewarding exercise for the author and a beneficial contribution to our shared expertise. ■

# EXPERIENCE ARCHITECTURE

MASTERPLAN · ARCHITECTURE · LANDSCAPE ARCHITECTURE · ENVIRONMENTAL AND BEHAVIOURAL ENRICHMENT · DESIGN · STORYTELLING

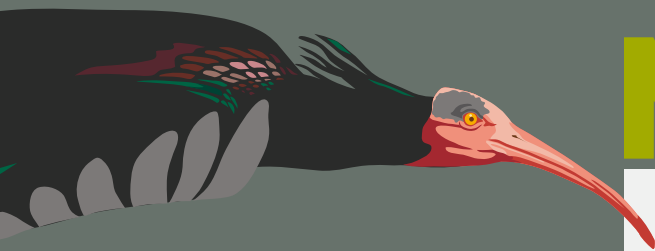


ISLANDS | Chester Zoo

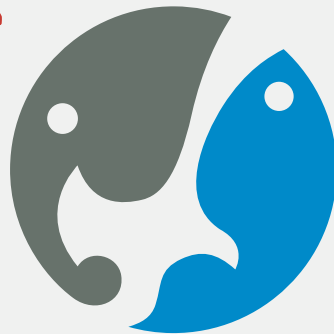
WE TURN AN EXPERIENCE INTO A BRAND + A BRAND INTO AN EXPERIENCE

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