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ORGANIZATIONAL STRUCTURE

Once the initial decision has been made to establish a major zoo the next step is to establish a base of support. Almost all zoos fall into one of three categories. There are those which are privately owned and operated. The majority of these are small, often poorly displayed and ill equipped, despite the best of intentions to develop good facilities. Both the sheer costs of building and operating zoos as well as the need for a range of specialized technical expertise, be it curatorial, veterinarian, educational or managerial, is sufficiently great as to be beyond the reach of most private individuals. While some notable exceptions exist, their success has often hinged on choosing single themes in which to excel, viz. Walsrode Bird Park in Germany, Parrot Jungle in Florida and, for a time, many of the lion safari parks world wide.

The second category of zoos are those which are government owned and operated. Many municipal zoos are of this type. The intent is often to consider such facilities as important tax supported recreational outlets for the largest number of people at little or no direct cost to the user public. This strategy is fine so long as the level of tax support remains adequate to meet the high costs involved and the sensitivity to the needs of the animals, maintenance staff and user public does not relax. Understandably, when faced with more pressing needs for essential social services, government agencies frequently find it difficult to be giving zoos high priority in the allocation of limited funds. In recent years the problems for entirely government supported zoos have been made worse by the pressure on government agencies to be making substantial cuts in financial assistance in all areas as they attempt to curb the high levels of inflation.

The third category of zoos are those which are operated by non-profit societies. They have a number of advantages over the other two categories which has resulted in them coming to represent the vast majority of the world's top zoos. The operating Board traditionally represents a cross-section of civic minded prominent individuals in the community who have an interest in animals. Their success and prestige in their association with the Board hinges on their contribution towards improving the quality of the zoo. As influential often business minded people who are usually sufficiently close to the institution to understand its needs, they are good candidates for insuring not only that the right level of outside funding is attracted but that the institution be run in an efficient business like manner while meeting its civic responsibilities.

The majority of the zoos in the third category are either government owned or partially government sponsored. Despite the complexity, this arrangement generally works well. The financial burden is shared, which is advantageous to both, while the Zoo Board is required to be accountable to more than itself.

ZOO MASTER PLAN

Once a suitable organizational strategy for developing and operating the zoo has been decided upon, the next step is to prepare a zoo master plan. This is a document which defines on paper the purpose of the zoo in clear and concise terms, and then describes the physical layout which best achieves that end. It is usually addressed to governing boards, the business community and/or government agencies, with a view to obtaining an endorsement to build and the necessary funds to make it possible. Given the readership, the information it contains is usually succinct, rarely exceeding 30,000 words, and is attractively balanced with perhaps as much as 75 percent of additional page space being devoted to maps, tables and relevant illustrations.

After defining the purpose of the institution, most master plans review the intended concept and set out the basic guidelines which are to be adopted. This is followed by a summation of data collected on site evaluation, which includes an assessment of climate, vegetation, landform, existing structures and other relevant constraints.

There is an examination of the proposed layout, including parking, traffic flow patterns, transportation, service space, utilities, etc. Initial data obtained on the site provides much of the basis for determining layout and intended capacity. Exhibit scenarios, type and arrangement are described in sufficient depth to identify paddocks, buildings, nature of viewing (moat, fence, etc.), and space requirements.

A suggested timetable for phasing the construction is often included. This is essential in most instances, given that there are rarely sufficient funds to undertake development of all major components at once. It can also be used to advantage to keep up attendance if each phase is completed, promoted and open to the public by the beginning of the visitor season.

Many master plans include a one- or two-page breakdown of projected capital costs. Obviously the writers who prefer not to address this area in the printed master plan must do so when making their presentation before the decision makers who, of necessity, interpret dreams in terms of cost.

Sometimes there is a section on attendance projections. Anticipating visitor patterns is so closely linked to determining how best to accommodate the public that it is surprising that not all zoo master plans include such basic information. By contrast some of the more astute zoos go a step beyond, and commission in-depth marketing studies of not only the patterns in public usage, but also the socio-economic background of their visitors.

Commonly associated with the preparation of the planning document is the development of a topographical model showing the layout of the site. Models help tremendously in visualizing the final appearance of difficult-to-appreciate concepts. When done attractively, they also serve as useful "selling" tools.

Fees for a professionally prepared zoo master plan often range between \$50,000 and \$100,000. While in some cases this may prove to be a lot to spend during the time when the promoters of the zoo are often struggling to attract sufficient interest to get the project off the ground, it must also be realized that such an important investment is actually very inexpensive compared to the cost of the average recently built zoo. Assuming that the intent is to develop an attractive zoo of a scale sufficient to serve the needs of a city the size of Beirut, one should be aware that few recently built zoos of any significance have cost less than \$10 million. At the other extreme, some recently built world class facilities, notably Minnesota Zoo and Toronto Zoo, have required investments in the order of \$45 million each.

If a complete master plan is more than an institution can afford at one time, it can be phased. There are zoos which have commissioned just a concept plan at less than half the cost. It identifies the objectives and priorities, includes a cursory analysis of the site and establishes a generalized schematic layout.

With this as a basic framework, more detailed planning can be undertaken once the basic concept has been approved. The Zoo Master Plan should not, however, be left out in favor of only developing specific plans for specific exhibits or buildings as funding for each of these becomes available. All too often zoos have had to later make costly investments either in digging up and relocating utility lines or in substantially modifying existing buildings that could have been avoided if sufficient resources had been allocated at the outset to planning the overall long term needs and growth patterns.

GOALS

What are the primary goals and objectives of the new zoo that is to be? What purposes can it best fulfill? What, in essence, is the concept? The answers to these questions need to form the introduction to the master plan. While goals can vary greatly between institutions, the majority of zoos tend to have a few common goals--namely, recreation, education, conservation and research.

Recreation

In those institutions where the zoo visitor is expected to contribute the greatest share in offsetting operating expense, recreational use is invariably the prime consideration. However, the provisioning of recreational use is an important service to the community in its own right, quite apart from its value to the zoo in attracting fee paying customers. It meets the visitors' first and greatest need, perhaps best summed up by a comment made by a patron: "After working hard all week, I need a break. The zoo is one of the places my family and I go to, usually once or twice a year. We can afford it, it's out-of-doors, the animals make it interesting, and we have a good time. My kids especially enjoy it."

Extended to include individuals from every walk of life ranging from senior citizens to tiny toddlers, from intellectually brilliant to mentally disadvantaged, from physically handicapped to physically robust, and it is no wonder that zoos out-attract in attendance all of the major sports events put together.

Getting the Message

If fulfilling the public's recreational needs is one of the primary objectives in having a zoo, education should not be considered far behind. The public as a whole has little appreciation of wildlife or of its rapid rate of extinction. Zoos have a responsibility to inform the public as to what is happening in the wild and to demonstrate their capability to save many species. At the collective level the International Union of Zoo Directors, International Species Inventory System, American Association of Zoological Parks and Aquariums and the Jersey Wildlife Preservation Trust, to mention but a few zoo related organizations, have been making increasing strides in this direction. On an individual basis the greatest impact to be hoped for is that zoos will stimulate public interest to the point of ensuring better care in protecting the world against further losses in biological diversity. Zoo layout and design are an integral part in strengthening the enlightenment process.

As an educational resource, zoos have the potential to teach those interested in learning. Some of the ways are by using the familiar forms of instruction, such as involving lecturers and films either in the classroom or laboratory, allowing selected members of the public to have access to a zoo library (i.e. docents, zoo members) and to be able to offer the public occasional field trips. Planning to meet these needs includes allowing for a wide range of physical structures encompassing often forgotten spaces such as lockers, docent cubicles and a room for brown bag lunches. Planning should also include the development of an organizational structure capable of filling the demand for the use of the educational resources by school groups and others, providing for the training of docents and making available talks, field trips, etc.

Important as this type of education is, it is received at best only by a minority of visitors. The bulk of people come to a zoo for enjoyment and not to engage themselves in any kind of formal education. To have an effect upon them, it is necessary to make learning such a fascinating experience that they cannot tell it from recreation. A few of the ways in which this can be done are by:

1. Creating a sense of total involvement. Sometimes this is possible by providing walkways that enable visitors to pass through exhibits. More often it is accomplished by taking parts of the animal's environment and extending these into the visitor corridor. In addition all animal and people barriers should compliment the setting, the signage should be thematically correct and even the costuming of zoo personnel should be appropriate to the area, where possible. While places like Disneyland, theme parks and some restaurants have long since recognized the importance of creating a sense of creating a sense of authenticity through attire, unfortunately the vast majority of zoos have limited themselves to providing only all-purpose uniforms.
2. Encouraging continuity of thought through the creation of one way traffic flow patterns past a series of exhibits that tell a story in stages. Although not uncommon in museums, this approach has only become prevalent in zoos in the past few years. It is also going through some teething problems as zoos experiment with finding what lengths of single theme one way paths to use before providing an opportunity for visitors to choose a new experience. Those that take more than about 15 minutes would appear to be close to becoming too long.
3. Developing a signage that is appealing and easy to understand. Signs in a zoo environment have to compete with a plethora of stimuli, much of it live and colorful. Couple this with the fact that almost all visitors are either standing or walking and it is not surprising that most signs fail to communicate. Studies at Brookfield Zoo have indicated that over half of the visitors rarely read signs while those that do spend an average of less than four seconds gazing.

**Conservation
and the
Animal Collection**

This has meant a shift away from keeping representatives of many species to maintaining breeding groups of fewer species. The change has had a major impact on exhibit design. Barriers between cages in many older zoos have come down. Off-exhibit breeding areas and nursery areas have been created and special provision has been made for incubators, hand rearing space, etc. Though such changes have been costly, the benefits to be gained are immense.

Most major zoos are working towards collectively maintaining self-sustaining, genetically diverse species, especially those which are threatened in the wild. A few zoos are beginning to seriously consider the ultimate conservation objective of returning vanishing species to those parts of their former range where conditions have improved. The Arabian oryx and the Nene goose are but two examples of species which have benefited by this kind of assistance. Between the First World Conference on breeding of endangered species in captivity held in 1972, and the third world conference held in 1979, the number of papers given on the subject of reintroduction into the wild increased several fold. It is only a matter of time before most of the major zoos incorporate such far-reaching conservation objectives into their master planning.

When small zoos start out they frequently emphasize local wildlife. On the surface this would seem to make good sense. These animals are often available free of charge from local Fish and Game Departments. Few forms are usually involved. There is much to be said for showing off one's own native wildlife.

Unfortunately the visiting public is rarely attracted in large numbers to exhibitions of native wildlife unless displayed in very exceptional ways (e.g. Sonoran Desert Museum). Most zoos, therefore, either plan at the outset to house primarily exotic stock, or come around to that decision after sometime. They also tend to focus on those traditional animals which the public interprets as star quality - notably lions, tigers, elephants, giraffes, zebras, gorillas, orangutans, etc.

Obtaining animals from the wild has become increasingly difficult and few zoos actually do it, and then only in rare instances. Most animals are obtained either through purchases from animal dealers (e.g. International Animal Exchange) or increasingly as purchases or trades with other zoos as their ability to breed and rear animals improves. Trading exchanges are usually in the form of breeding loans whereby ownership of the animal remains with the donor although it might never be transferred to another location than that of the recipient. Instead the "debt" is repaid by returning the first or second offspring to the original donor. Such exchanges are very common.

Shipping animals across borders has to comply with a plethora of regulations. Each country is different with respect to its importation requirements, and one should contact their department of health or agriculture as to what these requirements are. (In the United States, for example, all hoofed stock imported from countries which have foot and mouth disease must first be quarantined at an approved facility in the region and then once more upon entry into the U.S. Exotic swine, on the otherhand, are not permitted to be brought into the country).

If any of the species to be imported are listed on Appendix I or II of the Convention on International Trade in Endangered Species (CITES) then additional permits are required. Those species on appendix I can not be traded for commercial purposes. The importer must be in possession of a Convention export permit issued by the government of the exporting nation and an import permit issued by the appropriate department covering wildlife trade in the recipient country. Those species on appendix II must be covered by Convention export permits issued by the government of the exporting nations before entry into the recipient country. One should also be aware that some regulations, customs restrictions and permit requirements are required whenever export and import of wildlife is involved, irrespective of whether or not the species is listed on the CITES appendices. The documentation must accompany the animal at the time that it is being shipped.

Crating of animals must meet certain minimum standards. The airlines generally follow the procedures outlined in the International Air Transport Association (IATA) manual on live animal regulations.

Some unwritten, common sense rules also should apply. Avoid sending animals when the weather is overly hot or cold. All valuable animals should be accompanied by a senior keeper, curator or veterinarian (in some rare cases all three). Most airlines and custom officials are notoriously bad at caring for exotic animals.

At the very minimum all wildlife should be accompanied by zoo staff up until it is placed on the aircraft, and again when the plane touches down. If there is a stopover enroute it is also advisable that a local zoo staff member at the stop over point meet the shipment to make certain the animal is transferred safely from one aircraft to another; and to ensure that it has been watered and fed.

Research

Long range planning ought to include a provision for research. While most research programs in zoos are considered a luxury, particularly during the current period of fiscal restraint, some would offer substantial benefits, if encouraged. These are investigations that seek to:

1. Develop greater fiscal responsibility.
2. Increase the range of visitor services.
3. Enhance the staff's ability to fulfill those services.
4. Improve both the well being and reproductive capabilities of the animal collection.
5. Aid in communicating with the public, particularly in the area of bringing about an awareness of the rapid rate of decline in the world's flora and fauna.

All of these obviously "useful" objectives can be advanced by rather straight-forward measurements translated into management decisions. For example, it is fairly well known that a correlation exists between the length of time people stay in zoos and the amount of money they spend. By enumerating how much time people devote in looking at different exhibits one has a reasonable measure of the importance of each exhibit in contributing to the total experience, and therefore a basis for choosing which directions to take in exhibit layout and design which will enhance visitor interest and indirectly how much they spend.

The same pragmatic approach can be applied to the animal collection. An excellent example is the International Crane Foundation. It was purposefully set up because of the growing concern for the rapid decline of cranes in the wild and the near inability of zoos to breed them. The Crane Foundation gathered a collection of cranes of various species and began a series of research projects involving cage layout and design, nutrition, behavior activity, artificial egg incubation, etc. The common practice was to change the regime of only a few cranes at any one time, leaving the others to serve as controls. If the changed group showed improvement, then all were converted to the new regime. If not, then something else was tried. In short, research went hand-in-hand with applied management, and within a mere half dozen years the Foundation had succeeded in breeding and rearing a large number of the world's species of cranes.

DEVELOPMENT GUIDELINES

Perhaps not surprising, good zoos are often cheaper to build and to operate than bad ones. Their success hinges on their ability to take into account as many major practical considerations as possible without sacrificing quality.

Site Evaluation

No matter whether one is choosing a new location or working with an existing site, what is called for in a master plan is an assessment of a large number of basic site specific parameters which will ultimately determine how well the concept will be realized. The objective in any good design is to utilize to advantage as many of the existing features as possible from an aesthetic, functional and cost point of view. Some of the basic parameters are:

- accessibility
- off-site utility links
- climate
- landform
- vegetation
- existing on-site facilities
- animal inventory, if applicable
- existing exhibit distribution, if applicable
- surrounding land use

Each of these headings is to be subdivided and in most cases subdivided again. For example, under "landform" one would discuss:

- topography
- soils
- drainage
- water

and under "soils" one might include data on:

- types
- depths
- suitability to needs
- problem areas

At the tertiary level, the topics will vary dependent upon the size and nature of the site, how much data is available from existing sources and the extent of financial resources which can be used in undertaking inventories on the site. In order for the data to be as useful as possible in determining the eventual layout of the structures to be built, they should be expressed in map form to a standardized scale. Commonly the information is translated on to a large scale topographical map and reduced for inclusion in the master plan.

Choosing a Site

Accessibility is an important criteria for selecting a site. All too often potentially good zoos have failed to attract the high attendance they had hoped for because they were poorly located. Unfortunately a mistake of this type is permanent. Good accessibility means visitors can easily find the place and get there quickly. The situations that most fulfill these conditions are sites near the center of population catchment areas close to major highways. The bulk of one's visiting population should not have to drive more than about 30 minutes in order to reach the site. If the zoo exit is visibly marked on a major highway artery, this has the added advantage of advertising the zoo's presence to a large number of commuters day in and day out, year after year.

Select a site with varied, gently undulating terrain so as to maximize the landscape's ability to provide an interesting experience for the zoo visitor. Gently undulating terrain has additional advantages of offering both good drainage and an opportunity to more easily hide fencing and off exhibit buildings. Avoid choosing an area with steep terrain.

Ideally the area should have a few ponds and streams. Water is an attractive amenity to supplement any zoo experience, quite apart from providing suitable habitat for waterfowl and some other forms of wildlife. For a zoo located in a desert environment the presence of water is all the more appreciated. Generally avoid the inclusion of swampy conditions which may serve as a reservoir for disease, breed mosquitoes and present problems when constructing building foundations.

Sites which come endowed with an extensive array of tree species broken up into single individuals and small groves, such as to give a parkland appearance, provide an ideal setting. Trees aid in dividing the landscape into smaller units around which exhibits can be planned. They can be used to advantage in hiding structures and in reducing visitor awareness of crowds. For zoos located in desert surroundings they can be especially important in providing cool, shaded areas for animals and people alike, and in lessening the effects of wind. The presence of "greenery" in any form also has an aesthetic appeal that is appreciated even more by those for whom this is not a common experience. When trees do not exist, in most instances that means a zoo has to plant same at some expense and then wait 15 or 20 years for them to grow to a height sufficient to have impact. In such cases, the expense of moving a few large trees may be warranted.

Select a site surrounded by a natural buffer lacking in tall, man-made structures which would be visible from the inside of the zoo. If a water course passes through the property it obviously should be pollution free and likely to remain so. All of the basic utilities such as power, water and sewage should be readily available. Often there are restrictions on the use of sewage systems for servicing exotic stock, so check beforehand.

The trend is for choosing large sites, often occupying a square mile or more, capable of providing for spacious paddocks and plenty of room for expansion. While this trend is to be encouraged, their use requires careful planning if costs are to be kept down. Concentrate at least 80 percent of the pedestrian activity in a small area. Through the judicious use of winding pathways, trees, berms, gently rolling topography and one-way traffic flow patterns, the illusion can be created that an area is large and uncrowded (Fig. 1). Twenty or thirty acres can easily accommodate the pedestrian needs of more than a million visitors annually. Concentrating the pedestrian activity in a single core cuts enormous capital investment when installing utilities between buildings. Operating costs are likewise reduced. Less time, fewer personnel and fewer vehicles are required to service the area. Recognizing that a typical zoological park is characterized by substantial variations in daily attendance, a small core gives greater flexibility when attempting to provide goods and services and it helps to eliminate problems before they arise, or remove them when they do.



Fig. 1 — Through the careful planning of seemingly meandering paths juxtaposed with visual barriers, small areas can appear to the visitor to be much larger than they really are. (Parrot Jungle, Miami).

Parking

Plan enough parking spaces to handle both present and anticipated future needs. Many city zoos are inadequate in this respect. While it may not be feasible nor make economically good sense to provide sufficient on-site parking for the one day a year when a record number of cars may visit the zoo, allowances should be made to handle on site at least an average of the top 12 to 15 days in attendance, if satisfactory arrangements exist to utilize other parking sources when surpluses occur. School parking lots and some malls are empty and available on weekends and holidays. Occasionally arrangements can be made to lift no parking restrictions on approach roads. However, none of these solutions is as desirable as having a surplus of on-site parking.

Given that individual zoo visits begin and end at different times, the average parking space can usually be used 1.5 or more times a day during peak days. This obviously is very important to know when calculating how much parking to provide. However, in order for the spaces to be reusable they have to be able to be found. If a choice exists between providing a large single parking lot rather than several, perhaps better landscaped, smaller ones, always select the former in order to facilitate turnover. Single lots are also easier to patrol and maintain.

First and Last Impressions

With few exceptions each zoo has a single entrance through which all visitors must pass. Recognizing that first impressions count, it is worth zoos taking extra care, time and resources to ensure that the impression is superb. The experience should begin with the name of the zoo displayed on a large sign at the entrance to the approach road, beautifully landscaped and set against a natural backdrop. If it is good enough for visitors to occasionally photograph, the right effect has been achieved (Fig. 2).



Fig. 2 — This enticing entrance sign, visible from the highway, gives visitors a sense of entering a wildlife park with exotic animals.

Ideally the approach road winds for a short distance through an attractive park environment, setting the stage for the visitor to anticipate a high quality wildlife experience. If an entrance fee and/or parking charge is to be collected before entering the parking area, then allow both for an ample number of ticket booths and a sufficient length of approach road to prevent cars from backing up onto a main thoroughfare. By way of illustration, if the average ticket booth can process about 200 cars an hour, each carrying an average of 4.2 people, and a zoo has 20,000 visitors arriving on a busy day with about half of those arriving between 11 a.m. and 2 p.m., then four ticket takers working through the peak period could keep the lines moving without there being any significant number of cars backing up. In contrast if only three ticket takers worked through the peak period there would be a line over a half mile long. An additional means of coping with large numbers of visitors is to provide an area in front of the ticket booths which will permit as many lines of traffic to form for some considerable distance back as there are ticket booths. For example, an area four lanes wide and 440 yards long will accommodate the equivalent of a mile of cars.

Though often neglected, there is no reason why ticket booths should not be made appealing. For example, the ticket booth at the Santa Barbara Zoo in California, decked out in white facing, red tile roof and plantings, is in keeping with the Spanish setting of the zoo, and is both a delight and a pleasure for the visitors to encounter (Fig. 3).

The pedestrian entrance ought to be visible from anywhere in the parking lot. If the structure itself is not conspicuous then its location can be identified by means of colorful banners (Fig. 4). Traditionally pedestrian entrances have consisted of either an arch or a gateway. Usually they are associated with building structures, such as gift shops, administrative facilities, first aid and washrooms. The variety of types in use are innumerable, and this is good because it helps to make each zoo distinctive. Ideally, the approach is from the south side with the visitors looking away from, rather than into the sun.

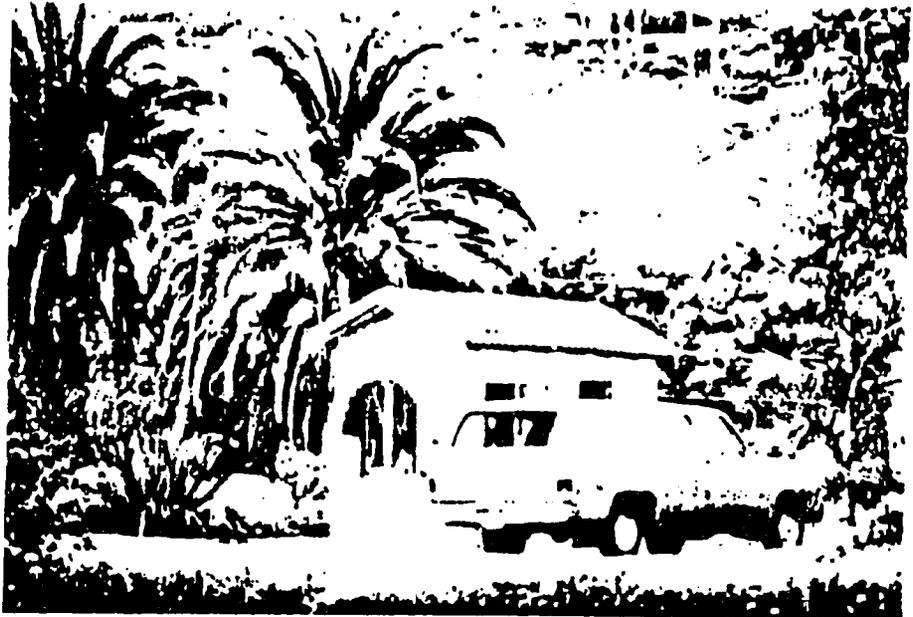


Fig. 3 — Parking booths can be attractive, as in this instance at the Santa Barbara Zoo, where much of the surrounding architecture is of this type.



Fig. 4 — At the Cincinnati Zoo, finding one's way from the parking lot to the otherwise inconspicuous entrance is made easy and exciting through the use of banners.

The needs of a visitor who is leaving are different from one who is arriving. He or she is usually more interested in purchasing gifts and postcards at this time than at any other. While the fronts of stroller rentals and film sales may best be directed towards those arriving, it is better if the gift shop faces the visitors as they leave. Indeed at some zoos the public passes through the gift shop when exiting.

Care should be taken to ensure that the visual experience is satisfying for the departing visitors. Often there are distant unsightly features which attractive fencing or plantings could mask. Rarely is there a sign which thanks the visitors for coming, although one set in an aesthetically appealing site would leave the zoo patron with a favorable impression.

Public Circulation

Taking a lesson from Disney World, public circulation patterns should aim to highlight the visitor's experience and enjoyment. Ideally, pathways should bend and weave in visually changing patterns. Rarely should they be straight. Designing a circulation route involves more than just the path. In order to maximize the use of limited space, every effort should be made to incorporate visual barriers in the form of berms, plantings and exhibits. At the same time visitors should have a general sense of where they are, and an opportunity to leave an area at reasonable intervals. Orientation can be facilitated in many ways. Maps and sign posts are the most commonly used aids. Better yet are easily recognizable reference points, such as distinctive entrances to pathways or buildings in combination with circulation patterns that locate exits within visual sight of entrances. Sometimes a single landmark is used to provide a visual reference over a wide area. The tower in the Copenhagen Zoo, the entrance banners at the Cincinnati Zoo and the Roosevelt Fountain at Brookfield Zoo are examples of this type.

In order to fulfill the greatest range of visitor needs, it is better if two or three pedestrian pathways are constructed rather than only one, as is common to most zoos. The primary pathways should be hard surfaced, designed for heavy use 16 to 18 feet wide and pass in the vicinity of most exhibits. Major services such as concession stands and washroom facilities are best restricted to major public corridors to provide for the largest number of people, as well as enable the facilities to be serviced by vehicles.

Secondary pathways are smaller, branching off from the primary route at frequent intervals. Their purpose is to provide not only diversity but to offer a more intimate contact with the exhibits. They are best interwoven through the natural landscape to avoid cross-viewing of people. The secondary pathways may be asphalted, approximately 10 feet wide and without drainage structures, allowing runoff to be absorbed naturally.

If asphalt or concrete pathways are used, they should ideally be stained or embedded with small stones that are reddish brown, or some other appropriate earthtone in order to reduce the high amount of reflective glare, characteristic of zoos which experience a lot of sunshine. It also helps to maintain the aesthetic appearance of the surface, especially as they crack with weathering and use.

Provision of adequate seating near exhibits, and in a desert environment preferably shaded, is important, especially for the elderly. Ideally, when seating is located behind the standing public, it should be situated on a knoll or some other raised position that allows those seated to see over the heads of those in the foreground.

Tertiary pathways are short, branching off and returning to the secondary pathways. Not intended for heavy use, they average only five or six feet in width and are generally the most sensitive to the environment, consisting of materials appropriate to the site such as cobblestones in montane areas and sand in desert exhibits. Provided there is good alternate viewing, such pathways need not meet handicap standards. Seating along such routes is best left natural, in the form of rocks or logs, thus blending with the landscape.

Whenever possible, circulation along the tertiary pathways ought to be one way. Traffic in one direction has many advantages. A larger volume of traffic can be sustained. A story line can more easily be developed. The visitors have a better experience along a narrow path without the interruptions of people flowing in the opposite direction. By making the tertiary trails short, the entrance to each conspicuous, and the less noticeable exit close to the entrance, visitors should not feel overly controlled, disoriented or unable to conveniently return to an exhibit for a second look.

Whenever narrower pathways are opted for, it is important that the trail widths be expanded to accommodate numbers of visitors at those points where they come in contact with popular, time absorbing exhibits. Failure to allow sufficient space for people to gather in front of exhibits happens all too frequently.

Although it is common practice to use public pathways as service roads, it is usually better if the two systems can be separated. Service requirements often conflict with the pathway objectives, necessitating wider corridors, heavier construction and more direct routes between exhibits. The use of the same pathways also means that servicing has to be limited to non-visitor times if the quality of the public's experience is to remain uppermost. The ultimate in separating the two systems is to be found at both Disneyland and Disney World, which have gone so far as to handle almost all of their servicing underground, totally out of sight of visitors.

Public Transportation

There is a plethora of transportation systems to choose from, dependent on attendance, size of zoo, availability and dimensions of pathways, topography and climate. The popular and financially successful systems tend to be of two types. There are the inexpensive, low capacity systems carrying perhaps 500 people per hour, that utilize pedestrian pathways. The vehicles usually involve some form of tractor engine and the users travel in a open car or cars. The experience differs from that of a pedestrian by having a narrated program and the convenience of a ride.

Then there are the more expensive, medium to high capacity systems which utilize their own pathways. Buses, sometimes with additional coaches attached, and railway trains fall into this category. The ability to attract a high attendance depends not just on the provision of a narrator and a ride, but in creating a totally unique and exciting experience which is unavailable to the walking patron. Seeing new animals in new vistas, the same animals at closer range (not further), being carried over water, through tunnels or temporarily elevated are all ways in which the passenger's experience can be enhanced.

Several zoos have tried using monorail trains. They are not recommended at this time for a number of reasons. They are expensive to operate, often to such an extent that they are unable to derive sufficient revenue from the zoo public to pay for their use. The capital expenditure to buy and install a monorail system runs into the many millions of dollars. There are complaints that the cost of new engines and new cars has been increasing at better than average inflation rates. Breakdowns are not uncommon, and maintenance costly, especially when they occur on a busy weekend in the middle of the main track well away from a shunt. Sometimes they can be dangerous. (On one occasion I witnessed a fire department having to rescue people from a monorail which was stuck at an elevated level).

Often futuristic and always conspicuous as man-made structures, they do not blend well with the concept of a naturalistic zoological garden or park. Limited to a large turning radius, usually to a single pathway and lacking any ability to negotiate grades, monorail trains also do not permit a high degree of close wildlife viewing. The common use of plastic windows that easily scuff add to the frustration.

While improvements are being made in some of these areas, the results are still far from satisfactory. Zoos, which can ill afford the expense, are obviously having to share in paying for the research and development that is going into making these changes.

The seating for almost all zoo transportation systems faces forward. This is not the ideal direction, as the interest is in seeing the animals in their exhibits, and not the path ahead or other unsightly features. The Bronx Zoo has recognized this and has made the seating arrangement on its monorail such that all passengers face left, are partially enclosed and are on one of two rows stacked one partially above the other (Fig. 5). Every visitor has an excellent view of the animals without being aware of the skyscrapers behind them.

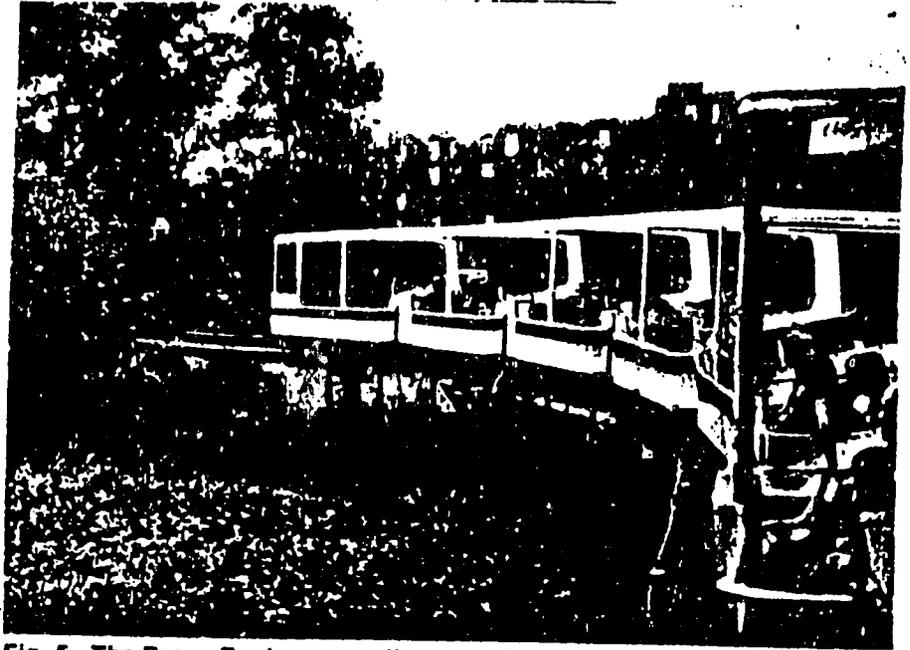


Fig. 5—The Bronx Zoo's monorail was designed to allow visitors to have an excellent view of the animals without being aware of the skyscrapers behind them.

Such a seating arrangement, if adapted to other zoo transportation systems, would have several advantages. Animal service facilities, chain link fencing or other unattractive necessities could be adjusted to exhibits yet be unseen provided they were passed on the left. Service vehicles could travel in front or behind and not be seen by the vehicles. There is the potential to give the passengers the impression that they are in a different area just by doubling back onto the same pathway and giving them a view of exhibits on the opposite side. An extra bonus is the protection against the movement of cold air on inclement days because of the solid back, ends and overhead walls. In a hot environment, when air movement might be desirable, the walls could be louvered. In either case, it is desirable over that of having to resort to a totally enclosed windowed space.

Exhibit Viewing

Developed initially by David Hancocks (1971) and others, and expanded upon by Jones and Jones (1976) in their master plan for Seattle's Woodland Park Zoological Garden, are a number of excellent criteria for designing exhibits that are applicable to most zoo situations. They recommended providing a number of selected views into outdoor exhibits rather than creating a continuous view along the perimeter, as is so often done even with newer exhibits. Selected views enhance visitor interest as well as provide the best positions for seeing animals. They also recommend that care be taken to eliminate the distraction of cross-viewing other people and exhibits either by screening or by restricting the width of view. All animals, they felt, should be seen at or above the visitor's eye level. This not only improves viewing but is less intimidating for animals. They further recognize the need to provide at least one major view location for interpretation of each exhibit which could be used by all age groups and the handicapped.

Viewing of many species can be a great deal more exciting and meaningful if not limited to ground level. For example, there exists an excellent exhibit in the Taronga Zoo in Sydney consisting simply of a wooden ramp that curves upwards to tree-top level past Koala bears feeding on eucalyptus branches, and continues to arc gently down to ground level again. The cost involved to construct the ramp is not substantial in relation to the benefit gain by having an opportunity to appreciate the animals at their own level and in their environment. Similarly the Arizona Sonoran Desert Museum has become famous for providing visitors with views of several animals in burrowing chambers below ground, and has now extended this approach to include a walk-through cave.

One of the most interesting approaches to animal viewing not yet existing in zoos is to be found at Salt Lick Lodge in Tsavo National Park, Kenya. In addition to providing the usual distant view of an assortment of wildlife drinking at a waterhole, they have given the visitor an opportunity to come into more intimate contact without the animals being aware. They have done this by laying down a culvert pipe below ground which is large enough for the public to walk through. A few lights and a bit of carpeting make the passage quite acceptable. The culvert terminates in a turret beside the waterhole just a few inches above ground level. From here the visitor has a dramatic view of the wildlife at sometimes little more than touching distance. From the animals' point of view, because they cannot see the people, they are neither intimidated nor frightened. The turret, being restricted to an inferior position in height, further helps in enabling the animals to feel at ease. Translated into viewing in zoos, such an approach means that it is possible to construct large, spacious exhibits while not limiting visitors to distant viewing. Obviously care must be taken in choosing the right point or points where a close contact can be assured.

Relief, Length and Habitat

In most zoos medium-sized mammals are publicly displayed in a series of cube shaped, small room sized cages. All wall faces are flat and easy to clean. Cage fronts usually consist of either glass or wire mesh. Cage furniture is restricted to one or two items that enable the animals to either climb, swing, claw, rub against, bathe or hide in. A food dish, if there is one, is commonly on view.

In general, improvements on this concept have been modest, such as painting a diorama along the back and side walls, curving of the back wall to eliminate the harsh lines where they meet with the side walls and increasing the cage furniture with emphasis on natural materials. Only a few zoos are as yet making radical departures from the old concept. The series of Minnesota wildlife exhibits at the Minnesota Zoo is one such example. The cages have been stretched into the equivalent of long hallways, giving the animals considerably increased distance over which they can travel, yet ensuring that they remain in close proximity to the public (Fig. 6). The back and side walls have been replaced with simulated rockwork. While the animals can negotiate most of its surface, allowance has been made to incorporate paths into the rockwork that look natural and are regularly used by the inhabitants. The sloping terrain facilitates cleaning. Windfalls, flowing water and plant cover in the form of low shrubs, where applicable, are incorporated into the design. Interestingly the animals are out-of-doors while the public is indoors, enclosed behind a barrier of glass.

Comprehension of the animal's world is further enhanced by providing a close dramatic view into more than one aspect of its environment. For example, the river otter can be seen either scampering around their terrestrial habitat or swimming under water in a natural setting. Care has been taken to see that the water surface is visible, as much of the activity occurs at or close to it. The Zurich Zoo has gone an additional step by including within its otter exhibit an underground sleeping den. Since some thoughtless visitors will always try to awaken the animals when sleeping by tapping on the glass, two layers of glass have been used.



Fig. 6 — At the Minnesota Zoo, visitors can see animals in long, naturalistic exhibits on the outside while they are on the inside.

Two other examples of exhibits that show more than one aspect of an animal's life are the margay and fishing cat enclosures at the Brookfield Zoo in Chicago. A simulated forest canopy within the margay exhibit provides a marvelous setting for displaying the arboreal attributes of these cats as contrasted with their behavior on the ground. In the fishing cat exhibit, small pools along a simulated stream bottom are stocked with minnows, providing a rare opportunity for cats to display natural hunting behavior in a zoo setting. The range of activities which can be exhibited for any given species is limited mainly by the depth of understanding about the animal and the extent of ingenuity to devise ways to display the features it has to offer. An excellent paper by William Conway (1973), examines this point of view at length. Titled "How to exhibit a bullfrog", he explores the many fascinating, display worthy, attributes about this common, not particularly attractive, creature that in theory at least could make it as exciting an animal to exhibit as any a zoo could hope for.

ATTRACTING VISITORS

A very rough "ball park" approximation of the total number of visitors that might be anticipated for a major zoo located in Beruit is close to 600,000. This assumes that Beruit with an approximate population of 1,000,000, were to develop a zoo whose attendance followed the average attendance pattern for North American zoos whose metropolitan populations ranges between 0.5 and 1.5 million (Table 1).

Most zoos find that the majority of their visitors live within a single population catchment area in close proximity to their institution. In order to achieve a high attendance year after year, these zoos have to attract most of the same visitors back again. That is best accomplished by having new things to promote each time. In the past, zoos have rarely taken such considerations into account in the master planning process, although the potential benefits are obvious.

During the early development phases of a zoo when many exhibits are being constructed, it is sometimes possible to regulate the phasing so one new major facility opens each year, just ahead of the season when most visitors come. After the zoo has been largely completed, or when the construction of new facilities is an affordable expense only every few years, there fortunately are other ways to create a sense of "newness".

TABLE 1. Attendance at zoos in North America whose primary catchment area has a population ranging between 0.5 and 1.5 million.

<u>City</u>	<u>Population</u>	<u>Zoo Attendance (1981)</u>
Birmingham	818,200	355,103
Phoenix	1,500,000	640,000
Tucson	500,000	416,000
Sacramento	800,000	320,000
Stanford	779,000	148,000
Atlanta	1,500,000	640,000
Honolulu	800,000	1,100,000
Indianapolis	700,000	289,212
Louisville	900,000	400,000
New Orleans	1,100,000	800,000
Grand Rapids	500,000	400,000
Kansas City	950,000	525,000
Omaha	500,000	420,000
Buffalo	1,060,000	430,154
Rochester	810,000	260,000
Syracuse	600,000	150,000
Cincinnati	1,500,000	426,000
Toledo	800,000	400,000
Oklahoma	625,000	520,000
Tulsa	678,627	283,000
Portland	1,098,100	701,867
Knoxville	600,000	600,000
Memphis	875,100	590,000
El Paso	500,000	241,000
San Antonio	1,070,245	973,000
Salt Lake City	560,000	561,250
Norfolk	1,000,000	400,000
Milwaukee	1,055,000	1,100,000
Calgary	600,000	717,215
Edmonton	850,000	242,000
Total	25,629,272	15,048,801

Average per 1,000,000 is 587,172

With careful planning a zoo may phase its breeding programs to highlight the births of popular animals, such as giraffe one year, hippos the next, and so on. During the years when few births are anticipated among popular animals, emphasis can be shifted to the acquisition of new stock of an equally attractive, easy to publicize nature, such as gorillas, white rhinos or Asiatic black bears. As with the opening of new facilities, and the featuring of new births, spring is the best time for acquisitions to occur if they are to have maximum public impact. While rearranging the collection with new popular animals is expensive, it is much less costly than building new facilities, yet may serve to attract just as many visitors. For this reason, as well as for the enormous conservation benefits to be derived by putting the right combination of animals together, greater effort should be made by zoos to spend more in this direction.

There are also other dimensions to consider in master planning a zoo. One example is the program developed at the San Diego Wild Animal Park. Located in an out-of-the-way location 35 miles from San Diego, with many other major attractions closer to the centers of population to compete with, it was recognized early on that special attention would be needed to ensure a high, sustained public interest. Among the considerations were the incorporation of an evening program and the development of animal performances. Both were, and continue to be, outstanding successes.

The evening program amounted to utilizing most of the zoo at night, but in modified ways. The paths intended for use were lit in soft, low light. The areas containing birds were closed. The train ride incorporated viewing of the larger animals by spotlight--more exciting than during the daytime when man-made barriers and other distractions are more in evidence. With some modifications, the animal performances continued. Stage lighting greatly enhanced the effect.

The major restaurant altered its menu to an evening, dinner-oriented public as opposed to a daytime, fast food requirement. Entertainment was provided to supplement the experience.

The introduction of an evening program resulted both in a marked increase in the total number of visitors and in per capita spending. In a desert environment during the hot season the attractiveness of an evening program would be even more exciting.

While a few zoos for many years have included animal performances as a part of the public's visit, the San Diego Wild Animal Park is probably the first to make it the major portion of the visitor's experience. Three outdoor amphitheatres were created, one for a bird of prey show, a second for an elephant show and a third for a horse show. Each performance lasts about 20 minutes with sufficient time allotted between performances to allow the public to casually walk to the next. The admission fee to the zoo includes entrance to the performances, thus avoiding lineups, space and the need for additional staff to handle the taking of money. The performances are both entertaining and of some educational value.

Potentially, animal shows provide a more powerful means of communicating with the public than do signs, passive exhibits, listening to narrators, reading brochures, pushing buttons, etc. In the past this potential was exploited for its entertainment value alone. Typically the public view performing animals either doing silly caricatures of human behavior or fulfilling stunts as part of an act which exemplified the trainer's dominion over his often dangerous subjects. Today there is a new wave of trainers. People whose primary goal is to assist the public in better understanding and appreciating the qualities of the animals with which the trainers work. In the process they are also discovering new levels of insight previously unknown to science. There are other benefits as well. It is obvious that sensitively trained animals are physically healthier and more mentally alert than many of their counterparts in passive exhibits which lack physical and mental stimulation.

There is little doubt that before long more zoos and aquariums will be making greater use of animal performances. In time, it may even replace much of the present interest in animal exhibits. Brookfield Zoo now daily offers eight different animal performances. At Sea World in Florida, visitors upon entering are provided with a timetable of performances so numerous that they can literally spend much of their day seeing little else.

From a practical standpoint, performances offer several advantages to the planner over that of new exhibits. They confine large numbers of people to a small area, thus freeing up space for other visitors, and therefore raising the level of attendance required to saturate the zoo. A series of performances can be used to maintain this effect throughout the peak period of the day. Public interest can be maintained by periodically changing shows, which is a much less expensive proposition than periodically constructing new exhibits. Animal performances also provide a convenient basis for regulating public activity in such a way as to control traffic flow patterns to the benefit of the zoo.

ACCESSIBILITY STANDARDS AND FIRE CODES

Laws governing the accessibility of all public facilities are becoming more stringent. In Illinois, for example, to meet the needs of those confined to wheelchairs it is recommended that path widths be a minimum of five feet, that path slopes not exceed a ratio of 1:12 and if the rise exceeds nine inches there shall be hand rails on both sides. Where ramps are not feasible, such as is often the case between floors, an elevator may be required. Such regulations place major restraints on building designs. When extended to include washroom dimensions, auditorium requirements, cafeteria specifications, etc., the additional cost can be considerable.

Fire regulations are also becoming more specific and costly to implement. Building materials have to be limited to those which meet flammability standards. Fire alarms, fire fighting equipment and fire emergency exits may be required in close proximity to the public. Smoke alarms, sprinkler systems and fire doors in the service corridors may also be necessary.

COSTS

At the beginning of this report it was stated that many master plans include a breakdown of projected capital costs, and that the writers who did not include such figures would in general do so during the presentation of the plan before the decision makers. Each facility is usually itemized separately, while utilities, landscaping and the like often have their own categories. The portion of the budget spent on conceptual documents, working drawings and supervision of the project during construction commonly varies between 10 and 20 percent depending on the size and complexity of the job to be done.

Often overlooked is capital depreciation. Buildings, especially those involving complex machinery, physically depreciate at a phenomenal rate, ranging between five and ten percent of the capital cost per year. When this is not budgeted for as part of the annual capital expenditure and it has to be paid, it ends up becoming a part of the general operating expenses. This can be an expensive mistake, given that the financial sources to cover capital expenditures are almost always different, usually more generous and sometimes easier to obtain than from those which cover operating expenses. Lumping capital depreciation with operating expense also results in many zoos operating in the red which would otherwise not do so.

Another legitimate capital expenditure sometimes overlooked is the start up cost. Testing facilities, acclimating animals, stocking concessions and training personnel are expenses of this type. Collectively, they can add several percent to the total capital cost.

CHOOSING A DESIGNER

Contracts for zoo design are commonly awarded piecemeal to local architectural-engineering firms having little, if any, experience in designing zoo facilities. Limited to on-the-job training, usually with neither the time nor the money to visit more than a handful of zoos, if that, they all too often come up with outmoded design solutions containing basic errors that could have been avoided.

Designing good zoos is a highly sophisticated field which cannot be learned overnight. Moreover, normal architectural-engineering training understandably does not include even a rudimentary introduction into what are the best types of barriers to enclose a variety of animals, how to design facilities to meet keeper needs, how to go about simulating a natural environment or create a thematic exhibit, where to locate a gift shop or a food concession, what are the options in choosing a zoo transportation system or indeed most of the important considerations that zoo institutions have to deal with when considering design and layout.

A better approach is to contract the task to one of the handful of zoo master planning firms. These firms either have expertise in most of the important areas or have access to individuals who do. Although they vary considerably in their approaches, the fact that they have established a track record in planning and constructing zoos means that a review board can obtain the kind of data it needs to determine at the outset which firm is most likely to do the best job.

How to Locate the Right Firm

Finding the best firm to do the job is a major task. How to go about it is a process which few instigators of zoos have had much experience with. Allow enough time to do a creditable search and review process. The first step is to pull together a list. Some of the zoo master planning firms advertise in the American Association of Zoological Parks and Aquariums newsletter. Another source is the International Zoo Yearbooks, every volume of which has articles on major new exhibits, usually with reference made to the firms involved. Still others can be found by inquiring directly with those zoos which are newly built or who have undergone major changes in recent years.

The next step is to inform the firms as to the nature, scale and intended timetable for the project, and ask that each submit a letter of interest along with their brochures and a sample copy or two of their most relevant master plans. All the materials requested up to this point should require little work on their part to provide, and yet should be sufficient to enable the review committee to weed out those firms which are not interested or which show obvious signs of lacking the appropriate skills. Each firm's previous master plan will reveal a lot about its ability to produce indepth documents specifically tailored to the needs of those institutions.

A detailed questionnaire should then be sent to the remaining candidates, along with a more detailed description of the proposed concept and other relevant information which will help them to more fully understand what is expected of them. In the questionnaire they should be asked for a list of their proposed project staff, their background and what percentage of their time each is expected to devote to the program, schematic design, design development, preparation of construction documents and the handling of construction administration. Not only will this indicate the quality of staff involved, but from this should emerge how much input is to be given by the principals-in-charge, which is a measure of how much importance the firm attributes to the project. It will also indicate if one person is to be primarily responsible for seeing the project through, which is usually the case. The more relevant the background of that individual, the greater his or her number of years of experience and the higher his or her position in the firm are all factors which can have a bearing on the success of the project.

Ask for a list of the proposed consultants and the extent of their participation. No one firm has all the experts they need in-house, but they may be able to make contact with some of the most qualified people. The intended extent of involvement in the project will indicate if the firm is suggesting consultants for appearance or because it plans to use them in a serious way.

Request a list of staff members in the past half dozen years and the annual billing for those years. This will indicate the firm's staffing and financial trend. It will also help to show the relative importance of the project as a proportion of the company's total business. Ask for a certified financial statement for the previous year. This also will reveal a lot about the company.

What is their fee? Each phase should be itemized and the rate for each individual indicated. Without spelling it out, obviously a great deal can be interpreted from the fee, especially in relation to the other information.

What is the extent of their professional liability? If the intention is to involve the firm both in the master planning stage, and partake in the preparation of working drawings and the supervision of construction, then such protection is a necessity. Coverage in excess of one million dollars is not an unusual amount to expect.

Similarly, forms which are being considered for involvement in all three stages should be asked if they have ever been under litigation. If so, they should explain.

Have they received any design awards? While not looking for zoo exhibits that are monuments to architects, there should be signs that the company is capable of creativity and innovation.

They should provide a list of recent projects, and for each of these there should be a brief description, along with a photograph, the square footage involved, the initial budget, the final contract awarded, the change order percentage of the base contract, the percent of change orders which were owner initiated, the estimated time for construction, the actual time it took and the names, addresses and phone numbers of the project owners.

The square footage and the financial information is another measure as to the scale of their projects. The difference between the initial budget and final contract awarded reveals if their projects end up costing more or less than initially planned. The percent change orders will give some indication if the planning process is usually of sufficient depth to avoid having to make extensive changes after the working drawings are completed. If the percent change orders were mostly owner initiated, it could mean that the firm was not at fault. The information on the time taken for construction will show not only how long it takes to complete their projects, but how able they are to finish on or ahead of schedule.

Ask how they intend to involve the client sufficiently to meet his needs, given the enormous distances and limited time available. Request a list of earlier clients who were located 500 miles or more away along with their addresses and phone numbers.

Check the references, and ask at least the following:

- How successful was the firm in identifying the needs of the institutions?
- What kind of relationship did it establish with both board and staff?
- How well did the firm fulfill its contract regarding budget and time?
- Was it able to devote an adequate amount of time to the project, despite the firm's being based in another city?
- To what extent has the resultant plan been put into practice?

After the review committee has examined the submissions and selected three or four finalists, the next step is to arrange for interviews. If possible, pick a date about a month in advance. This will give the candidates enough time to do a creditable job in preparing their presentation. Be sure to let each firm know that the competition has been reduced to only two or three others, as this can also have an important bearing on the effort they will put into developing their presentations. Request that there be in attendance at least one of the principals of the firm who will be involved with the project as well as the person who will be primarily responsible for seeing the project through.

Clearly a lot of work and some expense will have been required if the zoo promoters are to follow all of the suggested steps indicated on how to go about objectively selecting a firm. However, it must be remembered that the firm they choose will greatly influence how the multimillion dollar zoo will ultimately appear and function.

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APPENDIX I

Visual Planning Suggestions



Fig. 7 - The best entrance signs are easily understood and give a clear sense that exotic animals are to be found.



Fig. 8 - Ideally an approach road winds for a short distance through an attractive park environment, setting the stage for the visitor to anticipate a high quality wildlife experience.

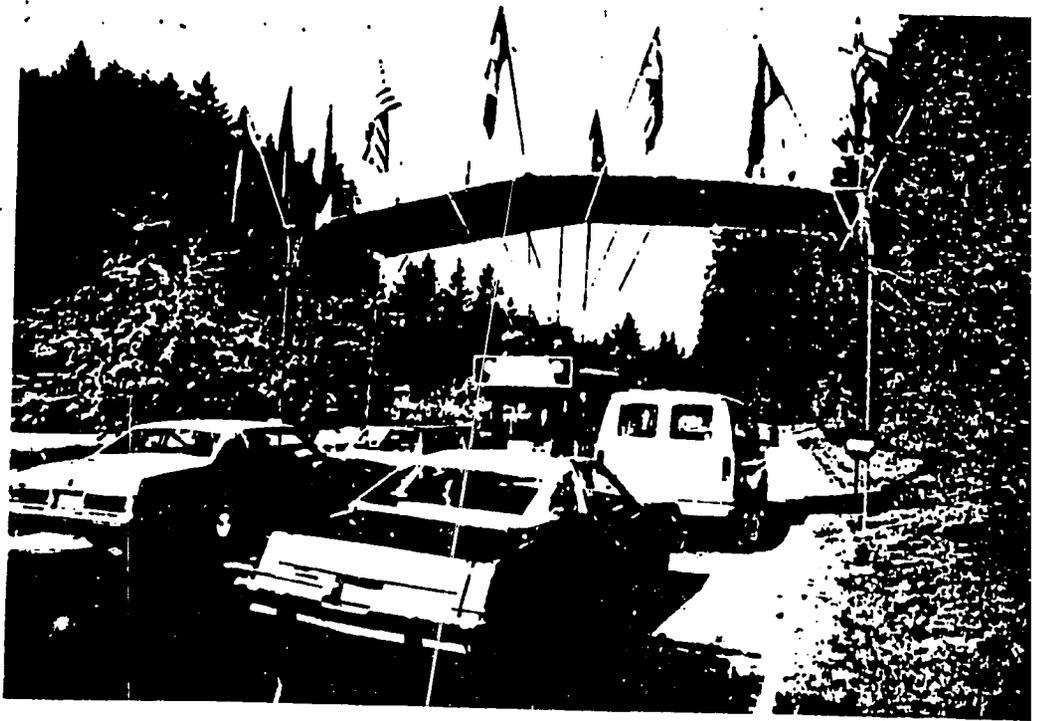


Fig. 9 - If an entrance fee and/or parking charge is to be collected before entering the parking area, then the site at which the collection is made ought to be attractive and inviting.

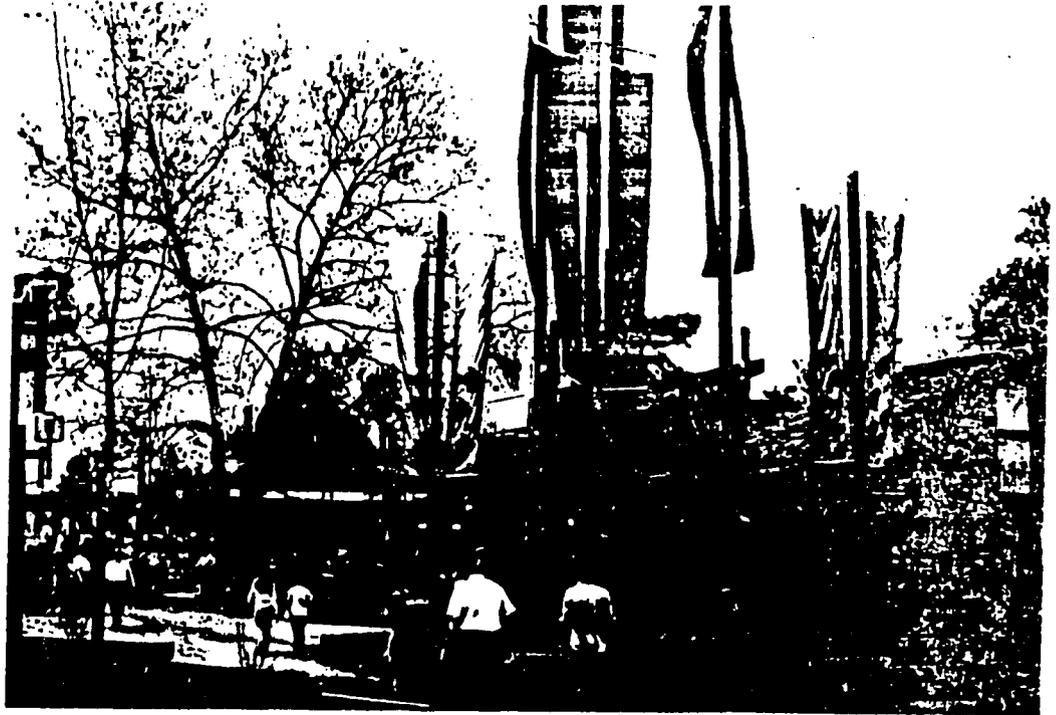


Fig. 10 - The pedestrian entrance ought to be visible from anywhere in the parking lot. If the structure itself is not conspicuous then its location can be identified by means of colorful banners.

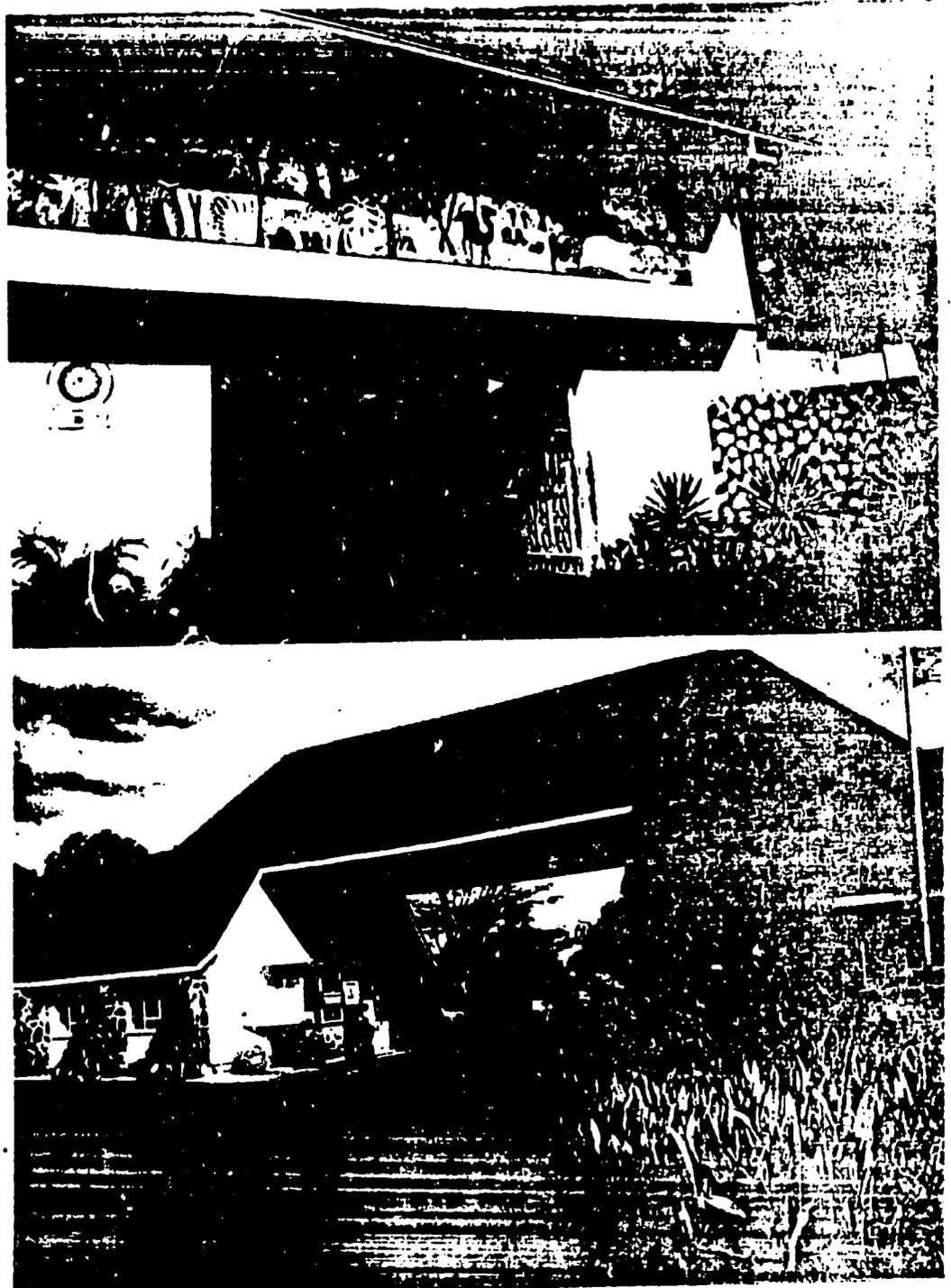


Fig. 11 - A common and attractive way to enter the zoo is through an arch. Such structures can also be made to serve other functions, such as housing ticket-booths, public toilets, a gift shop, a first-aid station and a lost and found facility, to mention but a few.

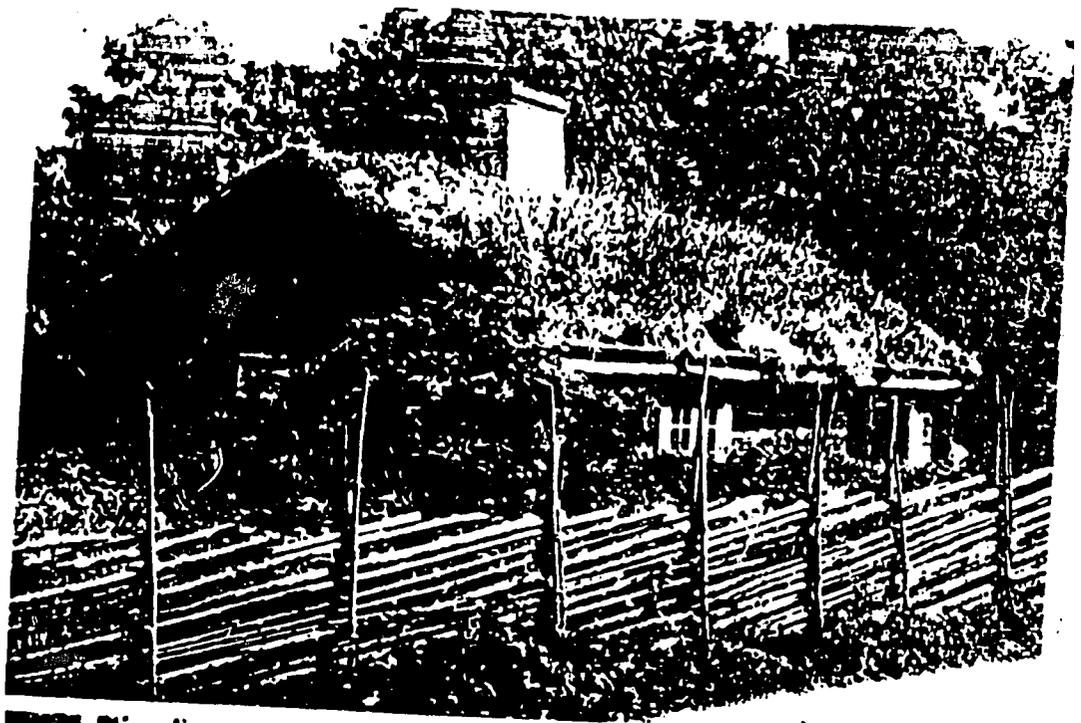


Fig. 12 - Given that the public has entered a zoological "park" or zoological "garden", the buildings within it should complement the setting. Rustic wooden structures are preferred over those which are outwardly imposing and made of concrete and steel. Thematically correct, they are generally cheaper to construct, easier to modify and less difficult to remove when no longer appropriate.



Fig.13 - Somewhere near the entrance there might be an orientation theater. Its purpose is to give the visitors a brief introduction as to what their zoo has to offer them and why it exists.



Fig. 14 - As with any theater, if the intention is to attract a high attendance from "off the street" then the show should be advertised as visually and correctly as possible. The dramatic graphic over this theater doorway clearly informs the visitors that its show is about wild horses. It also lets them know that it is a powerful moving film with some spectacular photography.



Fig. 15 - Generally the public is better behaved when it comes to staying on pathways than I think most zoos give them credit. When encouragement is needed sometimes an innovative sign will do.

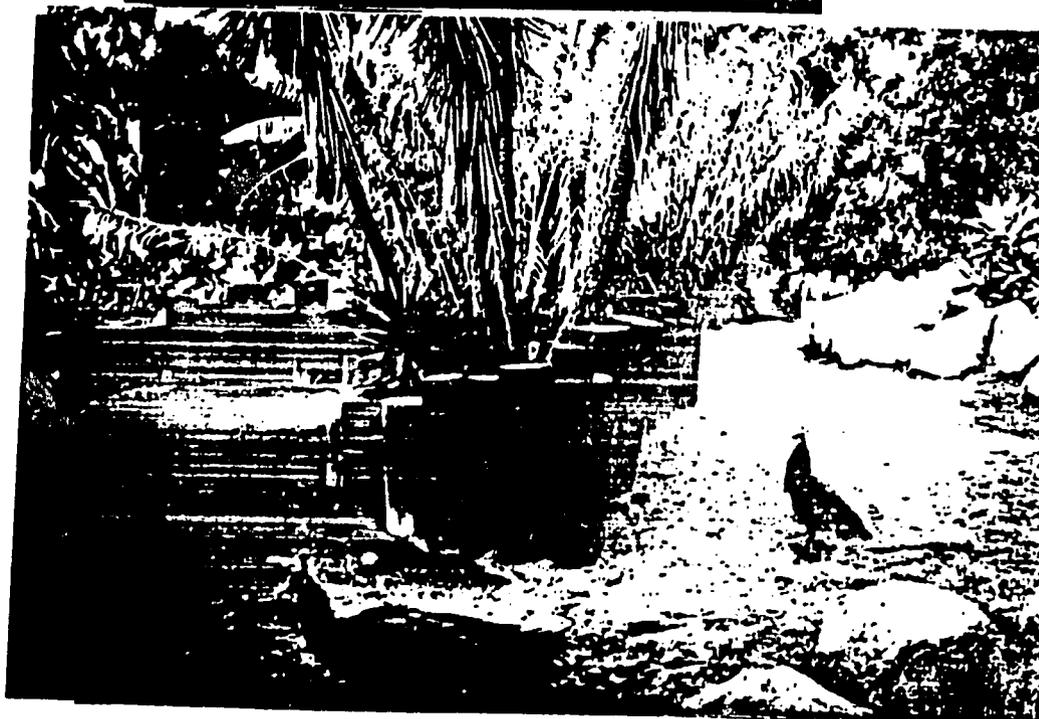


Fig. 16 - In particularly sensitive environments or where the public is less willing to cooperate, more elaborate methods of protection may be necessary.

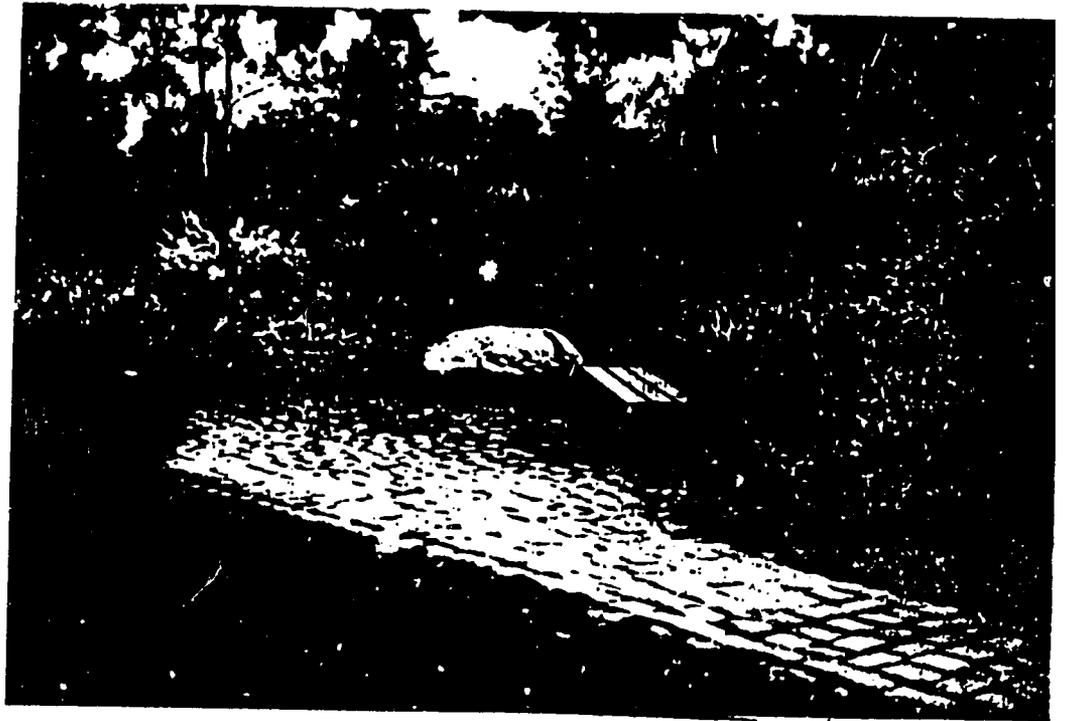


Fig. 17 - Allow for plenty of seating. The elderly are important zoo users, yet few adjustments are usually made for them, of which seating is a major consideration. Ideally the location of the park benches should be so carefully chosen, as in this example, as to be literally inviting. When seated viewing for an important exhibit is across a pathway, one might consider raising the seating onto a knoll or side of a berm such as to allow those seated to see over the heads of the public standing in front of them.



Fig. 18 - One cannot expect the elderly to journey to distant national parks in order to see wildlife. The majority have neither the money nor the stamina to do so. On the otherhand it is wrong to assume that their interests can be satisfied simply by sitting on a city park bench staring at the trees. Zoos provide something inbetween, where in the context of a stimulating setting they can relate to each other as well as watch or share in the family experience. In our modern society where the elderly are so often isolated from the younger generation, especially from children, they have at the zoo an opportunity to briefly cross these barriers. Simultaneously the institution provides a chance to see a great variety of fascinating and beautiful animal life in all of its stages of social development.



Fig. 19 - Another area often overlooked in zoos is meeting the needs of the handicapped beyond complying with government regulations. This is a special trail in the San Diego Wild Animal Park that attempts to bridge the gap with the blind. A rope serves as a guide along which they can follow.



Fig. 20 - At intervals they can identify plants through touch either in Brail or in English, as well as feel the actual plants in question. Extended to include various kinds of fur, feathers, scales, animal sounds, smells as well as a few harmless animals to touch, and the experience can be very fulfilling for those deprived of sight.

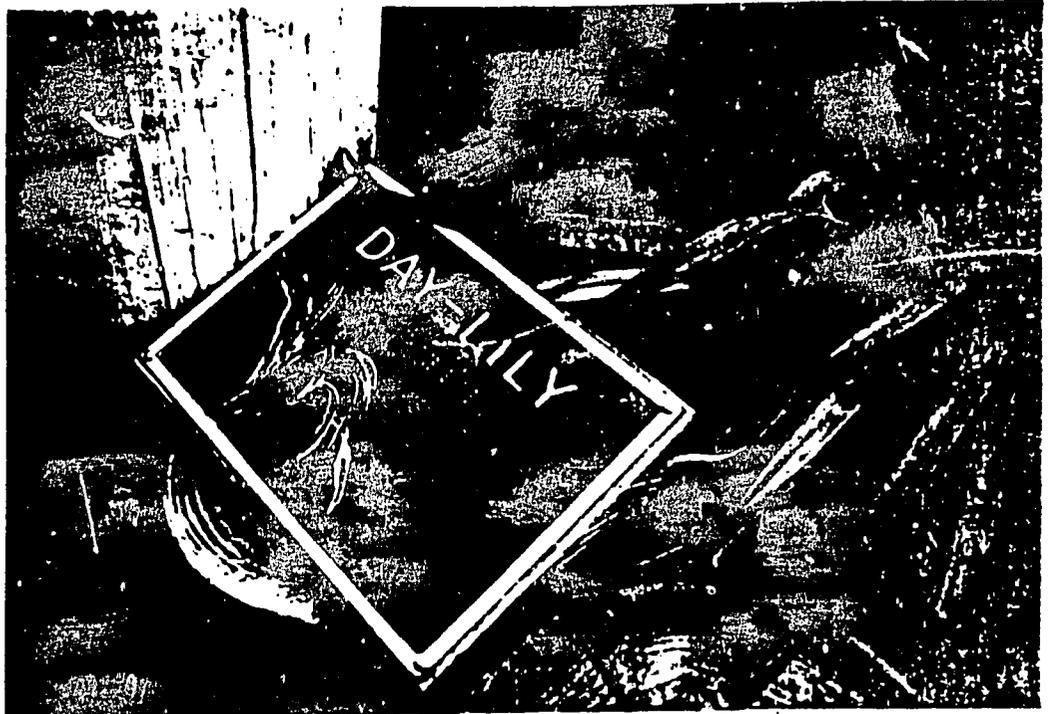
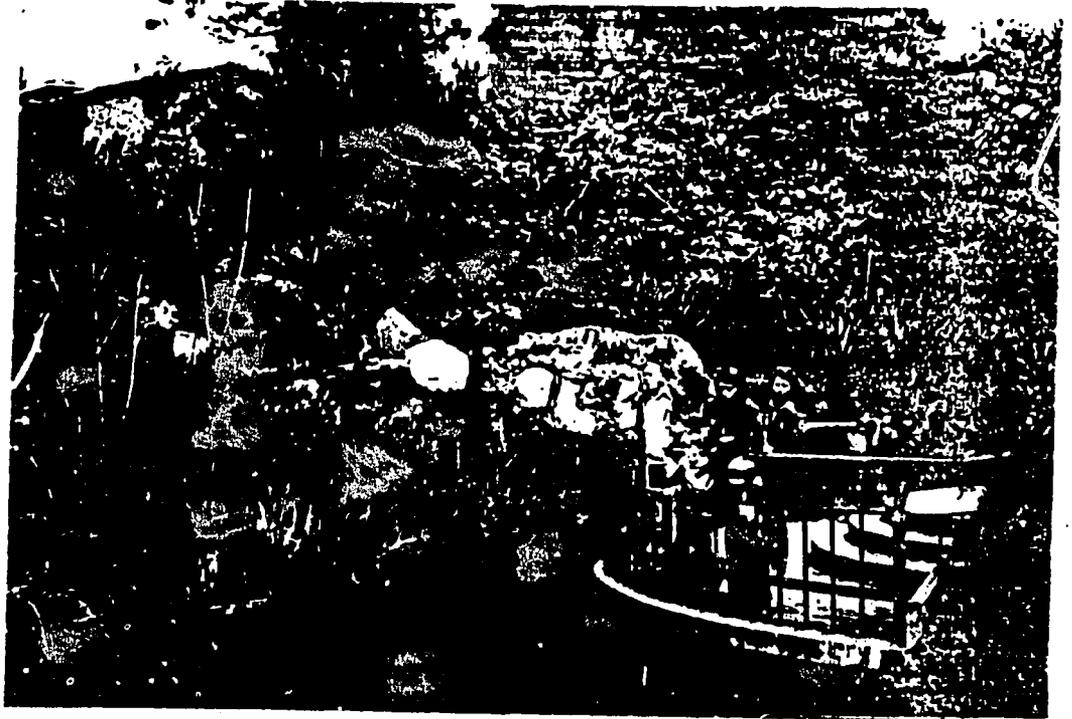


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Formerly most animal exhibits were overly small, devoid of vegetation and the presence of man-made structures, such as walls, moats, bars, feeders, resting platforms, climbing apparatus, etc., were blatantly obvious. While each major section of the zoo, be it hoofed stock, big cats, small mammals or whatever, had its own style of caging, all of the exhibits within each section basically were identical in appearance, bumper to bumper and had a straight public pathway in front with a continuous view. Such a format was easy to service and maintain. However from the visitors point of view it was monotonous. Commonly people skipped over exhibits, stopping only at those that contained animals that were either active at the moment or were spectacular in appearance..

Today there is an entirely new approach to exhibit design. The pathways interrupt exhibits rather than skirt past them, thus encouraging visitors to pause for a time rather than being distracted by other exhibits. No two animal holding facilities look alike. All man-made structures are made to appear as if they are part of the natural setting or are totally out of sight. The exhibits are well vegetated, reminiscent of the animal's original environment in so far as it is reasonable to depict.

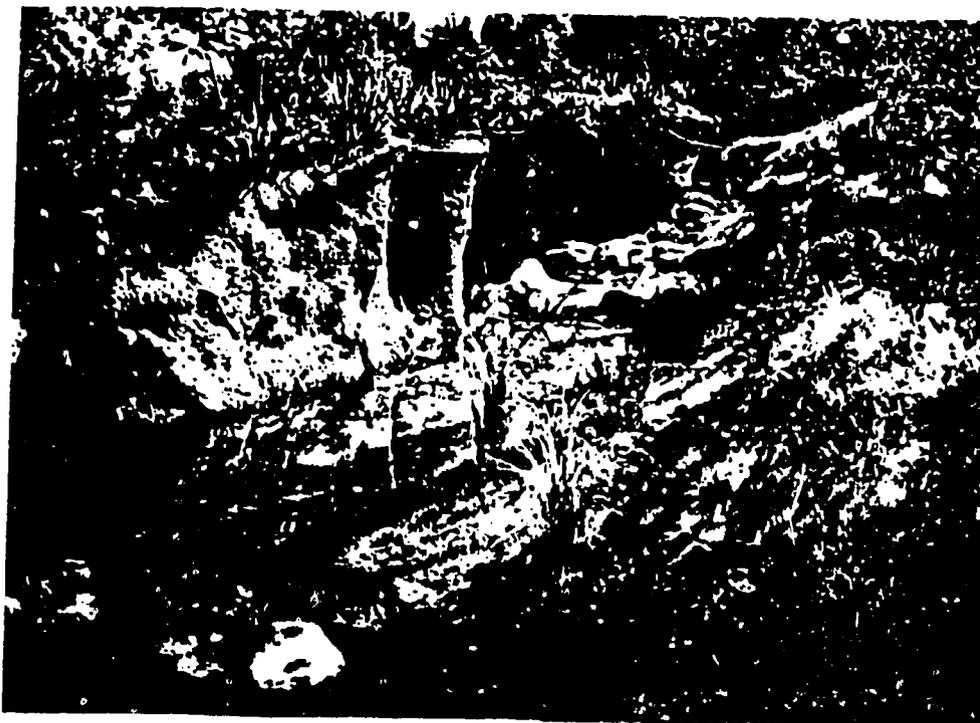


Fig. 21 - Some of the most outstanding examples of the new approach are to be found in the Seattle Zoo. In many of their latest exhibits everything is man-made, yet only an expert would know. What looks like a natural stream is actually water controlled by a valve to a specified depth in an artificial river basin made of carefully textured concrete and a mixture of both artificial and real rocks. The water serves as an attractive barrier to keep the animals back from the steep river embankment which is actually the moat wall and is also made of concrete.

The apparent profusion of wild vegetation both inside and outside of the exhibit is in reality a specified number of plant species most of which have been carefully positioned to obtain the best effect. Those on the inside of the exhibit are largely different from those on the outside, account having been made of those species which can withstand the onslaught of the animals within a confined area. Some are unpalatable. Some are tough, capable of withstanding moderate trampling or chewing. All have been given many months to become established before the animals were allowed in.



Fig. 22 - Control of the water level is extremely subtle. Very close observation reveals a tiny rim around the water's edge on the animal's side of the exhibit.

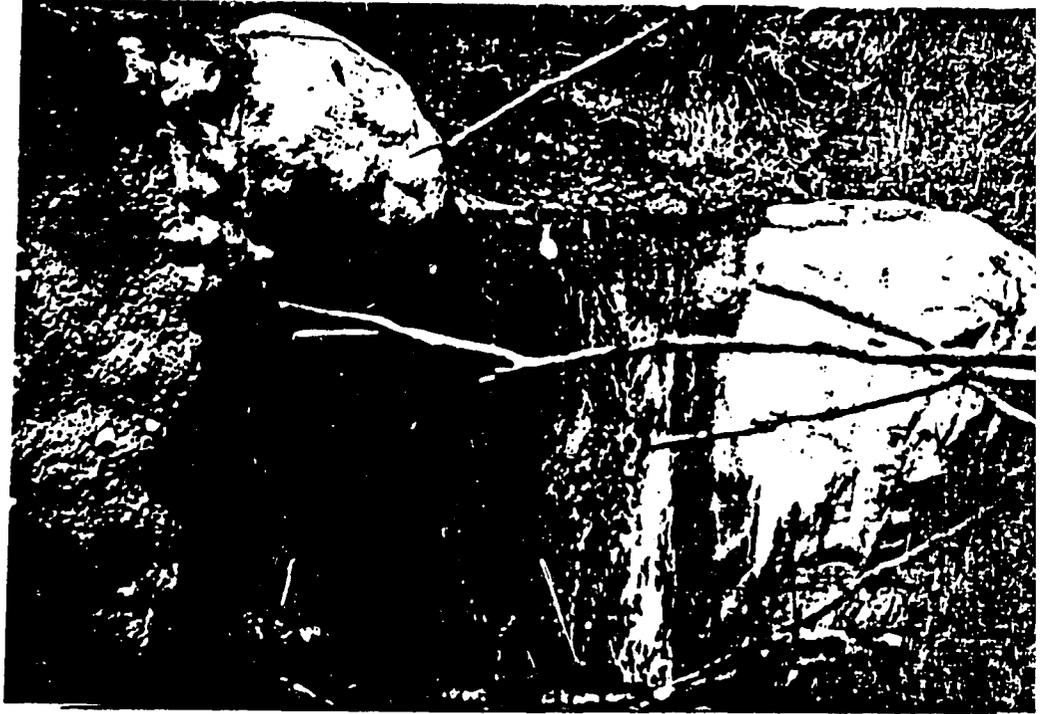


Fig. 23 - Where the water enters a small naturalistic waterfall has been created out of carefully textured concrete.



Fig. 24 - Traditionally zoos have maintained species along taxonomic lines. Birds, mammals and reptiles have usually been kept not only in separate exhibits but in different areas of the zoo. Such divisions were also reflected in the duties and expertise of the keeper staff.

With the increasing interest in creating more naturalistic exhibits, a few zoos are now mixing species, even between animal orders. For example, the red tailed hawk indicated in this exhibit at the Minnesota Zoo shared it without any difficulty with a grey fox. Implementing such changes is by no means easy. It involves both a new outlook on how exhibits are put together and a new approach to the strategy of animal care and maintenance.

Fig. 25 - Until about thirty years ago most large urban zoos built massive concrete exhibits as their answer to enclosing large, dangerous animals. As a concept it was a vast improvement over the smaller, barred exhibits. The concrete could be made to look like rock. The exhibits were easy to service. Passage ways, service areas and off exhibit animal holding areas could be built into the artificial rock work. Progressive though they be in their day, the state of the art has so changed that they are now considered far from adequate. Completely devoid of natural vegetation, they are about as foreign to their animal inhabitants as a lunar landscape. Like the dead tree in this exhibit, what furniture existed was generally an after thought. Boredom, begging and stereotypic behavior were an animal's basic outlets.



The average grotto is capable of lasting a half century or more. They are exceedingly expensive to demolish. As a result many of the large urban zoos which once spent vast sums in building them, now find themselves locked in the past. But perhaps no more. The Seattle Woodland Park Zoo has found a solution which appears to have wild application. In essence it involves incorporating most of the original structure rather than attempting to destroy it.

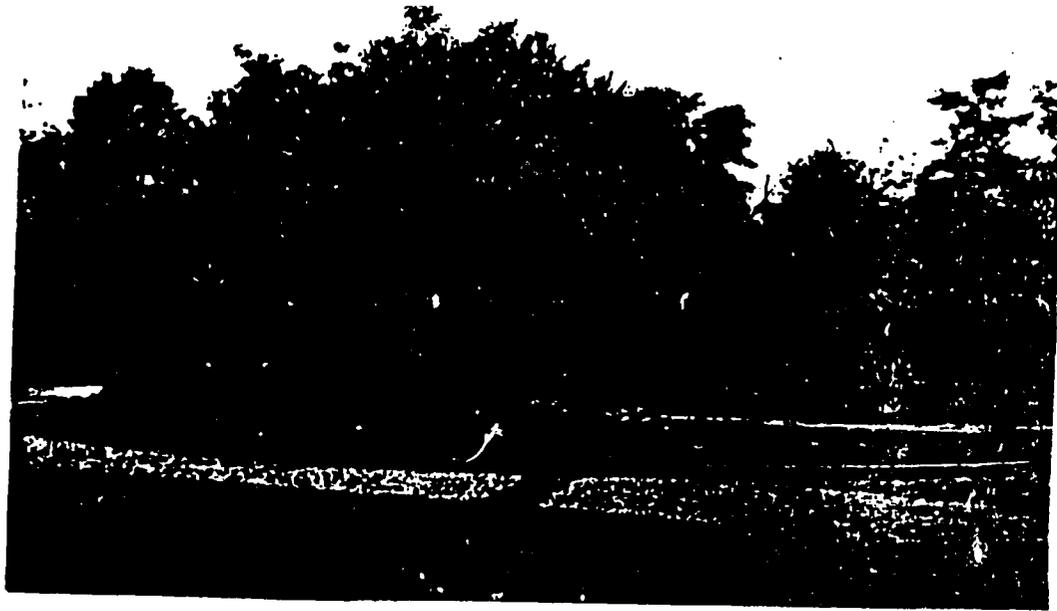


Fig. 26 - Starting with a grotto not unlike that shown in the previous photograph, the zoo decided to convert it into a naturalistic gorilla exhibit. They dumped a pile of dirt in front and planted it with dense vegetation.



Fig. 27 - A short trail weaved through the berm near each end.



Fig. 28 - The visitors that took it suddenly found themselves surrounded by lush vegetation on an intimate trail that could have been somewhere in tropical Africa. Behind them was lost the pedestrian mall, the crowds and the competing interests of other exhibits.





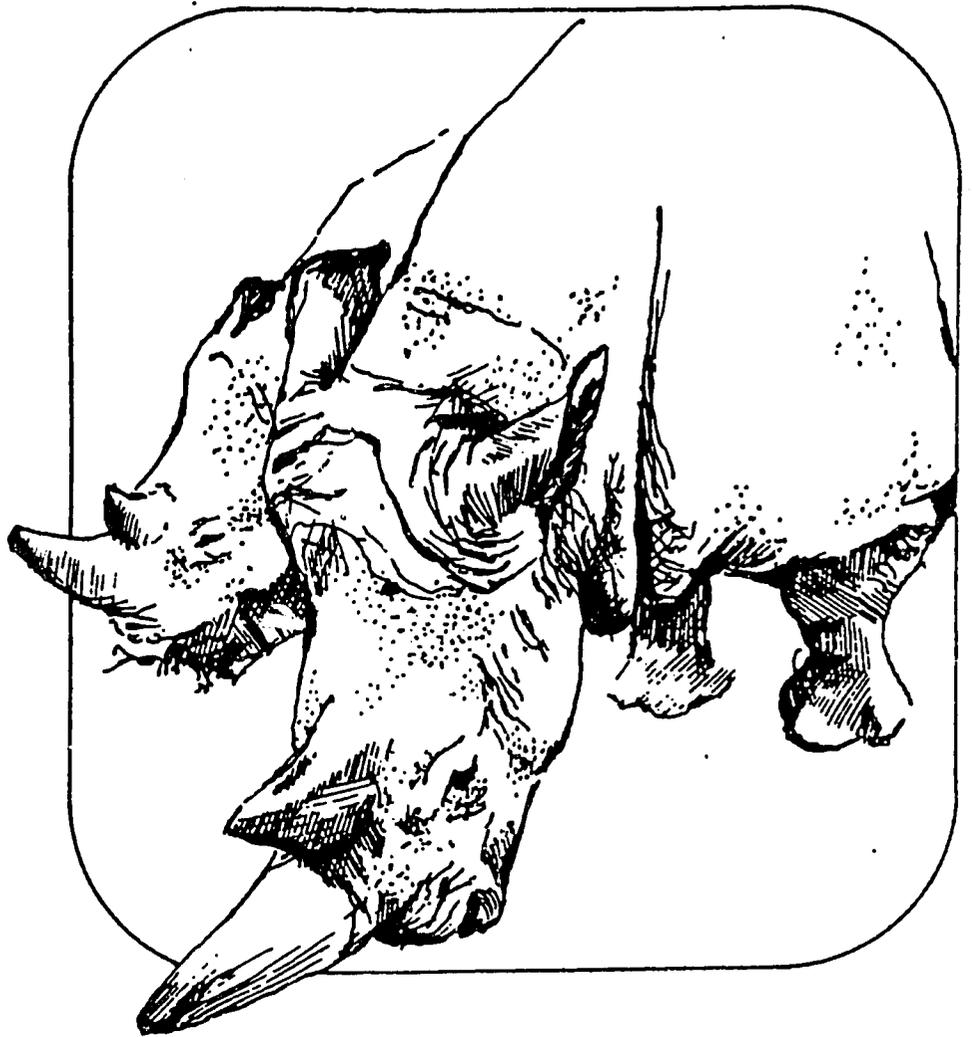
Fig. 29.- In the tropical jungle one does not expect to see panoramic views of gorillas. Recognizing this the decision was made to restrict viewing to a few choice portals framed by heavy vegetation. The direction and location of each portal was also carefully calculated to prevent crossviewing of other visitors.



Fig. 30 - Looking across the exhibit from the side opposite from where the public views reveals some of the features that made for such an impressive setting. The floor of the original concrete grotto was covered with gravel, sand, and several feet of soil. It was then planted and given nearly a year for the vegetation to become well established before any animals were released into the exhibit. A few large trees, only one of which is seen on the right, were moved into the exhibit and also given considerable time to become established. The canopied structure near the top of the photograph is one of the portals through which the public viewed the animals. Above it can be seen the berm. On the left is the wall of the original grotto, only the public side of which has been grown over with vegetation.



Fig. 31 - Although the gorillas spent considerable time foraging among the ground vegetation, it was so well established and the amount sufficient that it grew at rate faster than it could be destroyed.



APPENDIX II

Zoo Master Planning Firms

ZOO MASTER PLANNING FIRMS

All have prepared master plans for at least one zoo or wild animal park. Those indicated with an asterisk have prepared many.

Carr Smith and Associates, Inc.
Engineers/Architects/Planners
123 Almeria Avenue
Coral Gables, Florida 33134

* Herbert W. Reimer, P.C.
Architects and Planners
One Mayfair Road
East Chester, New York 10709
Tel (914) 961-3600

Inter Design Inc.
1409 Willow Street
Minneapolis, Minnesota 55403

* Jerry M. Johnson, Inc.
15 East Street
Boston, Massachusetts 02111
Tel (617) 423-9360

* Jones and Jones
Architects and Landscape Architects
105 South Main Street
Seattle, Washington 98104
Tel (206) 624-5702

* McFadzean and Everly Ltd.
209 South Main Street
Mt. Prospect, Illinois 60056
Tel (312) 253-2755

Sasaki, Walker and Associates, Inc.
Site Planners & Landscape Architects
23 Main Street
Watertown 72, Massachusetts

The Designers Forum
4638 N. Audubon Road
Indianapolis, Indiana

* Zooplan Associates, Inc.,
P.O. Box 756
Wichita, Kansas 67201
Tel (316) 263-1561