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ABSTRACT

Zoos generally claim their four purposes to be conservation, research, entertainment, and education. This paper is intended to synthesize the literature relevant to the educational function and provide an annotated bibliography of that literature. The first section of the synthesis, "Audiences," addresses staff, volunteers, outreach programs, and cooperation with schools and universities. The second section, "Purposes," traces the changes in the focus of zoo education, particularly over the past two decades. The next section, "Educational Components of Zoos," looks at animals, enclosures, areas, plants, signs, publications, and libraries. The fourth section, "Factors Affecting Education in Zoos," focuses on attendance levels, demographics, utilization patterns, temporal patterns, and social patterns. The final section of the synthesis, "Research on the Educational Impact of Zoos," examines various approaches to research on visitors to zoos. The remainder of the document is comprised of an annotated bibliography containing approximately 400 citations of literature published between 1928 and 1987 that pertain either to visitor behavior, education, or related research methods. (TW)

THE EDUCATIONAL ROLE OF ZOOS:

A SYNTHESIS OF THE LITERATURE (1928-1987)

WITH ANNOTATED BIBLIOGRAPHY

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Zoos generally claim four major purposes: conservation, research, entertainment, and education. This paper synthesizes the literature relevant to the latter purpose. It is one that raises philosophical, theoretical, practical, and methodological issues of considerable breadth and complexity. first, and this complexity is reflected in the organization of the paper into five main and twenty subheadings.

AUDIENCES

As educational institutions, zoos address the needs of at least five different audiences.

Staff

The first audience is the staff itself, which now often include specialists such as food service staff, pathologists, horticulturalists, graphic artists, nutritionists, educators, librarians, volunteer coordinators, and marketers, and administrators, each with their own distinct pre- and in-service educational needs. Colleges and universities play a hand here, not only in the fairly obvious case of veterinary training, but also in about two dozen U. S. schools that offer courses, programs or even degree programs aimed at zoo careers (Sammarco, 1985).

The widening purposes of zoos, the increasing value of the collections, changing values regarding wild capture, and the demands of increasingly varied collections are among the reasons that keeper education has become a complex task. At least two residential degree programs aimed at training keepers exist in the United States. One is offered by Santa Fe Community College in Florida (Giron and Van Diver, 1973; Van Diver, 1978). The second is offered by Moorpark Community College in California (Brisby, 1985). Both provide classroom and internship experience, maintain their own zoos, and cover roughly the same academic topics. The slight differences are consideration of careers as park rangers or veterinary assistants in the Florida program, and of zoo planning and studio training at Moorpark.

In an effort to identify keeper training materials, Poff (1985) sent questionnaires to 97 zoos, 51 of which responded. Of these, 35 have no formal keeper training program, 14 have a formal program, 11 have their own manual or procedures booklet, 20 follow the AAZPA Training Manual in some way, 19 conduct voluntary or compulsory lectures, 22 have books or articles available and 11 have videotapes or films available. Five of the zoos depend on on-the-job training but felt it was inadequate. In at least one case, this training recognizes that keepers are important in educating the public. Keepers are specifically trained to serve as guides at the Phoenix Zoo through a course offered by a local community college (Stinson, 1984).

Undoubtedly the most systematic nonresidential effort in keeper education to date is the animal management course developed by the National Extension College in England. Zoos considering their own course would do well to review this program before deciding to put the effort necessary into developing their own course.

More recently, concern for inservice or continuing keeper education seems to be emerging as an issue (Iliff, 1972). Awareness of the need for advanced or inservice keeper and staff education aimed at such issues as improved animal handling and husbandry, environmental enrichment, animal behavior problems, improvement of educational impact of exhibits and keeper involvement in research increasingly is a topic of discussion (Laule, 1985).

At least four associations address the educational needs of zoo professionals. Both at the local and the national level, the American Association of Zoological Keepers [AAZK] have a number of inservice education projects and a natural concern for career advancement of members. The American Association of Zoological Parks and Aquariums [AAZPA] publishes extensively on topics vital to zoo administrators and sponsors an advanced week-long course on zoo administration. The International Association of Zoo Educators [IZE] provides a forum for exchange of educational program ideas, philosophies and evaluation methods through its meetings and journal. The recently formed Consortium of Aquariums, Universities and Zoos [CAUZ] aims at promoting communication leading to collaborative projects among these three types of institutions and their staffs. From the viewpoint of a zoo or aquarium director, such an organization promotes staff development, improves morale and motivation, facilitates obtaining people for specific tasks requiring specialized skills that cannot be hired full-time, can enhance research programs and broaden fundraising efforts. The costs in space, time and changes in routines seem well-worth the potential benefits (Sheng, 1986).

Independent of CAUZ, potential areas of cooperation between Oregon Coast Aquarium and Oregon State University were identified and additions to and changes in facilities to accommodate short- and long-term goals were made while the aquarium still was in the planning stage to accommodate expected long-range needs. Examples include addition of a multiuse room designed to meet the varied needs of 11 university departments, spare desk space, provision for group entry, off-exhibit holding space for both animals and plants, flexible display space, a Coastal Culture Exhibit, modification of cash registers to provide data for the university's hotel, tourism and restaurant program, estuarine research space, and a wave machine. One research and one educational project were selected from among many suggested to initiate the cooperative relationship (Zwalenberg and Nightingale, 1986).

Volunteers

Second, many zoos make use of volunteers or docents, community members in other professions but with a special interest in animals. Volunteerism is an extraordinary phenomenon in the United States, which particularly since the early 1960s has enabled zoos to provide many important services that otherwise would have been far beyond their resources. However, such programs are not without problems, which are of three general types: volunteer/public, volunteer/volunteer and volunteer/staff (Seal, 1981). Under these circumstances, the proper balance between zoology and such skills as communication probably should receive more attention in the design of volunteer training programs.

Commonly, volunteers complete a training program and graduate to providing a wide variety of needed zoo services including escorted tours for visitor groups and eventually may instruct future docents. Cotter (1987) reported on methods for identifying and prioritizing training needs, and on

evaluating the effectiveness of training as a means of maintaining a viable and effective program. Birney and Shaha (1982) found docent-guided zoo visits to have significant impact on visitor knowledge concerning relatively unfamiliar animals such as cavies and tapirs, but no significant impact on visitor knowledge concerning either moderately familiar or very familiar animals such as chimpanzees, polar bears, raccoons and badgers, when compared with visitors who read signs or visited unsigned exhibits.

Volunteers also staff booths or are stationed at selected exhibits to provide visitors with information. For example, Iliff (1975) reports a program in which Junior Zoo Aides were stationed near exhibits of eight endangered animals. Brochures directing visitors to these exhibits were passed out at information booths and the exhibits themselves were supplemented with photographs and text on man's impact on the species.

Attrition reduces the effectiveness of volunteer programs and leads to strategies for retention. For the most part, dropping out is a process that occurs over time due to an accumulation of factors, rather than a single event, so that intervention programs aimed at retention are theoretically feasible. At least 25 factors appear related to level of volunteer satisfaction, and 5 of these can lead to an intent to leave even if satisfaction is high. Sellers (1987) presented a model based on these factors that is potentially useful in accommodating existing research and, ultimately, in improving retention in volunteer programs at zoos.

Outreach Programs

Third, zoos often have formal but popular educational programs for community members in general. These include public lectures, evening or weekend courses, field trips emphasizing local flora and fauna, summer programs for students, and most ambitious of all, tours to destinations such as Africa or the Amazon. These programs sometimes are offered in cooperation with local universities, sometimes in cooperation with the Zoo and Aquarium Travel Association [ZATA], which promotes conservation through educational travel involving field research (Ashton, 1984).

Some zoos operate special programs such as day camps (Breuggeman, 1982), summer safaris (Turner, 1983), a mobile program for the physically handicapped and institutionalized elderly (Kinville, 1968). and a wide variety of imaginative special events (Hartline, 1983). One of the most popular outreach efforts is the zoomobile. A survey of 26 US zoos determined that another popular service, the zoomobile, is served primarily by volunteers; serves nursing homes, hospitals and schools; and reach 5000-6000 people per year. About half operate only during the school year. The maximum distance and time traveled is about 100 miles or about 2 hours. Half provide free programs, half charge and almost all require external funding of some sort. Programs typically lasts 45-60 minutes (Stieg, 1984). Among the important dimensions of zoomobile programs are appropriate vehicles and equipment; whether, on what basis, and how much to charge for programs; what audiences to serve; what kinds of programs to offer (Schroeder, 1985); and the proper balance between education and entertainment. Related issues over which there probably has been more heat than light revolve around contact animals, anthropomorphism, and the impact of such programs on exotics kept as pets. At the very practical level, there are questions of animal stress, acclimatization, the appropriateness of training or taming of exotics, and visit frequency and

pricing. At the most fundamental level is the issue of what educational purpose zoomobiles serve. Every zoomobile implies its own answers to these issues, while a few are struggling with them explicitly (e.g., Churchman and Wood, 1986).

In Topeka, the zoo and library combined efforts for the benefit of the zoo visitor, the library patron and the cultural life of the community. The library passes out zoo literature and frequently features zoo exhibits, while the zoo brings live animals to the library for story programs. The staffs cooperate in developing annotated reading lists, which are distributed widely in conjunction with the programs (Clarke, 1966).

The Tierpark in Berlin has operated a Youth Club since 1963. Students age 12 and up select and join one of 25 interest groups (e.g., mammals, insects, botany, photography) which average 20 meetings per year. Groups plan their own annual activities, which result not only in increased knowledge of such topics as ecology, but also such qualities as perseverance, precision, conscientiousness and neatness (Zwirner, 1975).

Cooperation with Schools and Universities

Fourth, zoos serve students in their communities from elementary through graduate school. While the former may be learning simply to recognize certain animals, the latter often are developing field research skills. Some cities have magnet schools specifically oriented to zoos similar to that in Buffalo, NY (Dailey, 1984) or Los Angeles that orient a substantial portion of their curriculum to the zoo. More commonly, the zoos work to coordinate their educational program with the schools. This is the case in Berlin (Dathe and Zwirner, 1974) Chicago (McCann, 1977), Cleveland (Reuther, 1966), Edinburgh (Chaplin, 1977), Fort Worth (Quinn, 1972), Los Angeles (Birney, Wood and Churchman, 1986), Oklahoma City (Kinville, 1968), Prague (Vesolovsky, 1966), and Vancouver (Proctor, 1969), just to cite a few examples.

Field trips are a major component of the zoo-school relationship. Recognizing that they involve the five major phases of preparation, anticipation, experience, recollection, and integration, and that impact on learning is highest during anticipation and recollection (Winn, 1986) will maximize their value by encouraging teachers to plan them more systematically. Field trips often involve specialized groups such as art students, suggesting that it is inappropriate to think of zoos only in terms of science education.

Recreational Visitors

Fifth, recreational visitors are largest in numbers and the most diverse in their makeup and needs. They range from infants in carriers to the elderly, from grammar school dropouts to zoology PhDs, from first-time to frequent visitors. Some visitors spend 5 seconds at an enclosure, some 5 minutes. Some read the signs, some don't. Those who don't may not be able to read, may not read the language of the sign, may have read them on prior visits, may read some but not all signs, or may already know more about the animal than the sign tells. People learn differently, and they learn different things. Unlike schools, zoos are not called upon to teach the same things to all people (Linn, 1981). Market research at San Diego Wild Animal Park suggests that we can do more to help visitors develop positive attitudes by providing them with (1) a more active experience, (2) planning more activities for children, and (3) providing for change when designing facilities and programs.

The educational literature provides many strategies appropriate to such aims as information retention, attitude development, and encouraging action or involvement (Donahoe, 1986).

Most zoos have an area aimed primarily at young children. As real animals become less familiar in an urbanized world, it is important that these areas aim at offsetting the highly anthropomorphized animals of television and movies. It is equally important to keep such areas small in scale and to permit manipulative learning. As this is difficult to do and still handle large numbers of peoples, Brown (1973) suggests not one large, but numerous small areas, for children. This approach encourages variation and innovation. The areas can be opened and staffed in proportion to the number of visitors expected each day, so is economical. It solves the educational problem and may reduce visitor fatigue or promote return visits.

PURPOSES

At the most general level, the major purpose of zoo education as seen by zoo educators has been remarkably stable for at least two decades. Brereton (1968) saw conservation as the underlying theme of the San Diego Zoo's entire education program. Blyth (1972) saw the aim of zoo education as awakening an interest and knowledge of the animal kingdom with a special interest on conservation, and more recently Blakely (1981) argued that the proper function of a zoo is to interpret animals in relation to their ethological activities or ecological niches and to foster a conservation ethic that will lead to public action to save the environment.

Despite frustrations stemming from the complexity and magnitude of the task, zoo and aquarium staffs are aware of and willing to face the challenge of conservation education. We know that parents and the young are most amenable to our message, and we know the importance of trend-setters and leaders in shaping values. We know that the public has little feeling of immediacy, responsibility or stewardship toward conservation problems. Zoos themselves often are inconsistent, selling junk food and souvenirs and espousing consumerism in our zoos while asking our visitors to concern themselves with conservation of remote and obscure species, rather than practicing and preaching recycling, composting and energy generation (Rabb, 1985).

Education programs should be expanded beyond just informing people that there is a wildlife and habitat crisis. Knowledge without action creates anxiety and is ineffectual. Exhibits can be combined with programming, such as the short ecology plays pilot-tested on the main pathways of the Philadelphia Zoo, or the National Zoo's festival that includes mimes, drama and puppets, take visitors beyond the passive signing on which we have become overly dependent. They also boost attendance. There is a growing awareness of the need to group exhibits around a theme, such as Burnet Park's "Wild North" which takes visitors from least- to most-impacted environments so as to educate visitors about the balance of nature. Unless zoos want to become completely outdated, they must keep moving forward, both in terms of what they want to achieve and in how they do so (Freeman, 1985).

The World Conservation Strategy (International Union for the Conservation of Nature, 1980, 1984) emphasizes world issues such as tropical deforestation which few of the world's zoo visitors will ever have much opportunity to

affect directly. Karlin (1986) stresses the need to begin with local issues, or relate the global ones to local conditions or actions that can be taken locally. One way to do the latter is through World Wildlife Funds Project TRAFFIC. The traditional function of the project is to track the illegal trade in such items as furs, ivory, leather, and live animals, and to provide data to government agencies. But, the subject also lends itself well to education in zoos. There is a large and poorly understood illegal trade in wildlife, and many of the species involved are exhibited in zoos. One possibility is a "Wildlife Trade" day in which special exhibits staffed by docents are set up near popular but endangered animals. TRAFFIC makes educational materials available that would aid in such an effort. A travelling exhibit also is available, as is a regular newsletter (Lehman, 1986).

Despite this apparent long-term unanimity, zoos offer educational programs having little do with ecology and conservation. This implies the existence of additional educational purposes that are seldom discussed. Unless one believes that all the audiences listed above have the same educational needs, that list also suggests that conservation may be necessary to zoo education, but certainly is not sufficient.

For example, zoos increasingly are being put on the defensive in dealing with such issues as research, evolution, and abortion. It has been suggested that zoos might be more successful in educating the public if they would address such issues more directly and if they would shift from emotive language associated with controversial subjects (e.g., euthanasia) to that associated with farming and animal husbandry (e.g., culling). It also has been suggested that zoo educators are likely to have the skills necessary to successfully explain these issues to the public. While these issues often divide zoo staffs from members of the public who oppose keeping any animal in captivity, there are other issues related to the educational purpose of zoos, such as policies on the use of contact animals or views on anthropomorphic language, that divide zoo professionals.

On another level, the assumption that the primary purpose of zoo education is limited to science also is being questioned. Papers delivered at the IZE conference in Edinburgh discussed possibilities such as art, literature and special education. A committee of the International Association of Zoo Educators (Churchman, et. al., 1986) is addressing the broad question of the relationship between animals and human culture. The committee argues that zoos should foster awareness of the involvement of animals in literature, music, history, art, medicine, religion, folklore, language, commerce, food, and adornment of the world's cultures, present and past, and is developing materials to facilitate achievement of this goal.

These materials involve thousands of facts that challenge--even require--finding or developing meaningful patterns much as Linneaus sought to discover an order he assumed to be present in nature. Is there a useful explanatory system for the complex, changeable and contradictory functional and symbolic relationships between men and animals that the catalog illustrates?

Four general efforts to identify such patterns have been identified, each distinct in method and result. Rollin (1981), a professor of philosophy teaching courses on ethics in a school of veterinary medicine, grounds his work in moral theory and western intellectual history. Kenneth Clark (n.d.)

based his work on function as portrayed in art. Kellert (1979, 1980, 1983, n.d.) has employed survey research to infer attitudinal patterns. Tucker (1982) interprets views on environmental issues as rooted in social class. Baumer (1977) interprets continuities and changes in views about nature through 350 years of European intellectual history.

Others have taken less general but still challenging approaches to the question. For example, art historian George Ferguson (1954) has identified symbolic meanings associated with sixty animals in Medieval and Renaissance European art. Animals play a major role in heraldry (Fox-Davies, 1985). Anthropologist Joseph Campbell (1983) has traced the diffusion of Neanderthal and Cro-Magnon artistic themes and shamanic cults to, respectively, Northwest American Indian and Australian Aboriginal art. Psychologist Bruno Bettelheim (1976) has suggested that many of our attitudes are shaped by attributes ascribed to animals in popular fairytales we learn as infants. Not surprisingly, Kenneth Clarke puts it most elegantly: "Animals have been the subject of worship, fear, admiration, love, curiosity, self-identification, cruelty, greed. He continues: "How did some animals acquire and retain their status as divine, or at least become symbols of the gods? Why did they come to be included among the signs of the zodiac? How did three animals [ox, bull, lion], hitherto accepted as pagan gods, become symbols of the evangelists. Throughout history, man's feelings about animals have been complex, changeable and contradictory."

A third challenge to the traditional narrow focus on conservation is emerging in new ideas for zoo design. Hall (1987) argues that the division between zoological parks and botanical gardens is archaic. Robinson (1987) has pointed the way to the development of what he calls Bioparks. Zoos, botanical gardens, and natural history museums create unnatural divisions of the natural world that no longer are philosophically valid. They could be combined to provide a unified view of the living world by presenting plants and animals as integral parts of ecosystems. Photosynthesis, pollination, and the coevolution of flowers and insects are of great potential interest. The conservation of plants certainly is as important to our global ecology as the conservation of animals. The value to biological education of fossil, skeletal, and anatomical material can be greatly enhanced if it is integrated with living plants and animals. Ideally, these can be selected to illustrate broad principles. No exhibit about life can ignore evolution. currently it is a target of antiscientism. To counteract this, the Biopark could simply exhibit, without strident comment, some of the major cases of "artificial selection," and emphasizing their role in literally making civilization possible. Or, we can move beyond the present naturalistic style of exhibtry to demonstrate how animals perceive the world, which has the added value of undermining the kind of anthropomorphism that gives people an unreal view of animals. We must show that the view of life in the wild as a life of freedom is a concept relevant to Rousseau but not to biology.

Clearly, imbuing people with a conservation ethic is <u>not</u> the only purpose zoo educators can serve. Perhaps we would do well to debate this issue more thoroughly from a much wider perspective than hitherto has been the case.

EDUCATIONAL COMPONENTS OF ZOOS

Animals

The primary educational component of zoo exhibits are the animals themselves. Learning is both cognitive and affective, and varies among visitors on the basis of their previous knowledge. But, visitors may have arrived with most of the knowledge exhibits are intended to impart (Shettel, 1976) and, worse, may create or reinforce stereotypes or teach visitors that behaviors uncommon in nature are characteristic of particular animals. Sommer (1972) points out that zoo animals often "display sexual aberrations, a heavy incidence of aggression, and the blah-ness common to many animals that don't have anything to do in a concrete cage." Animals in parks have learned that people often throw food to them, so can be seen trotting along behind the trams that take visitors through the parks--not the kind of behavior one would expect from a wild animal (Geddes, 1985).

Enclosures

Animal enclosures are potentially educational. Buttons allow visitors to adjust floodlights on some Sea World tanks to approximate the light-filtering curve of the Caribbean at four different depths (Powell, 1974) At Himeji City Aquarium visitors can change the position of obstacles to see for themselves how blind cave fish still are able to avoid them, or to rotate resin disks under tanks and observe the changing color of fish such as sole while listening to a tape recording explaining the phenomenon (Uchida, 1973). The literature includes hundreds of additional equally useful or stimulating examples.

Enclosure design must consider biological needs of the animals, convenience and safety of the keepers, costs, and the viewing and educational needs of the public, so that compromises often must be made. However, exhibit quality tends to be judged most in terms of its naturalness. It is asserted that such exhibits reduce the amount of text required to explain the ecosystem in which an animal lives and how it is adapted to it, are more likely to meet the environmental needs of the animals, reduce viewer boredom generated by identical enclosures for all animals, and are aesthetically pleasing (Bacon and Hallett, 1981). Crandall (1964) believes that making zoo enclosures as much like the natural habitat of animals as possible produces the kind of exhibit that causes the public to be aware of the zoo as a place of learning, while the challenge of finding animals interests many visitors and leads to speculation about the need for camouflage. Despite the easy acceptance of these assertions, it is well to remember the old addage that common sense often is neither in view of the lack of evidence either supporting or refuting it.

Apart from the potential educational impact of enclosures, they are important too in how visitors assess the quality of a zoo. Enclosure cleanliness, animal comfort, and quality of animal care are the main factors shaping overall judgment, whether or not actual animal needs are understood by the visitors (Wolf and Tymitz, 1981).

Areas

Zoos necessarily group animals together in some way, most often by continent or taxa, although carefully developed themes are rare and the educational potential of such groupings is poorly exploited. There are exceptions, of course. The Birmingham, Alabama, Zoo has grouped predators together, including insects, big cats and eagles. The Lodi, California, Zoo has just opened an exhibit grouping animals to teach visitors about biological adaptations to tropical forests. The Bronx Zoo recently opened its ambitious Jungle World exhibit, which may have had its origin in Conway's (1968) Faustian dream in which the manifold possibilities for exhibiting bullfrogs are explored, including their biosphere, evolution, habitats during the four seasons, life cycle, food, enemies, economic importance, relationship to man, and place in music, folklore and art, and distribution over time as wetlands disappear around the country. The Paneewa Rainforest Zoo has grouped several exhibits to model ecological changes with altitude on Mauna Kea mountain (Juvik, 1977). Most ambitious of all, the Burnet Park Zoo (Syracuse, NY), has just reopened after three years work developing exhibits such as animals as endangered species, extinct animals, animals as social beings and animal adaptations (Aiello, 1984).

The African Kopje is the first exhibit in San Diego Zoo's long-range plan to rebuild the zoo in bioclimatic zones. The exhibit is important too as one that brings to fruition many of the theoretical ideas that are found in the recent literature. A multidisciplinary team was involved from the start in unifying animal management and educational goals into a unified whole. Concepts were selected before exhibit design began on the basis of a formal needs assessment that identified visitor characteristics and led to the selection of conventiongoers and mothers with children as the primary audience. This resulted, for example, in inclusion of a touch pool and a sandbox in the plans. Cognitive, affective, and experiential goals were identified and 15 specific objectives selected. The exhibit was designed to achieve these objectives, and provision was made for, and an external evaluation of the exhibit was carried out which will provide much of the needs analysis for the next exhibit to be designed (Piper, 1987).

Studies that address the extent to which visitors learn anything from exhibit groupings still are rare. The evaluation of the San Diego Kopje exhibit already has been mentioned. The only other instance identified to date was conducted at the Natural History Museum of the Smithsonian Institution. Wolf and Tymitz (1978) report visitor comments such as "The exhibit has a flow to it and that helps to show the messages. The hall gave me a feeling that there was a message here". The particular hall being evaluated did in fact involve a number of major themes, including glaciation, periodicity of climate change, sea level changes, gigantism, emergence of man, and mass extinction. Clarke (1980) notes three reasons for using architectural devices to guide visitors and group exhibits purposively. First, the nature of science (the ideas of modern biology are abstract and complex). Second, the nature of human memory (which is aided by provision of a context into which information may be assimilated). Third, the nature of perception (which moves from the concrete to the abstract).

Plants

The most overlooked educational component of zoos probably are their plant collections, which in some cases are said to exceed the value of the animals! Beyond mere identification, a still low-key horticultural education program suitable to zoos might address themes such as plants as food and shelter for birds, plants that attract butterflies or bees, rare and endangered plants, plants used to feed zoo animals, evolution, domestication, effects of habitat destruction, and interdependence of animals and plants (Hall, 1987). The New York Botanical Garden has operated a continuing education program since 1919 which has quadrupled in size during the preceding decade. Landscape design, biological illustration, nature photography, commercial flower arranging, nature photography, children's gardening, and horticultural therapy are among the topics addressed.

Signs

Rensenbrink (1966) views communicating with visitors as the most important problem facing zoos. But, communication begins long before the anyone arrives with the public service announcements to attract visitors and the phone call to find out the hours. Those designing all visitor communications should understand the image the zoo desires to achieve, and strive to achieve it at all times in all communications (Fisher, 1987). A comprehensive visitor communication program should be designed that takes account of visitor needs from beginning to end. Such a program begins with multimedia advertisements to interest the public in coming to the zoo and highway directional signs to help them find it. It should include printed materials such as zoo maps, food stand menus, and even tram tickets. It should include items sold in souvenir shops including guide books, posters, and even the type of toys sold. A comprehensive signage program includes not only the highway signs, but also parking lot and entrance signs, building and facility identification, donor signs, directional signs, animal and plant exhibit identification and interpretive labels, traffic control signs, special events signs and even exit signs (Litwak and Kaestle, 1987).

Signs are the most obvious and important communication devices, and must be durable, easily cleaned, easily removed by staff but not by visitors, inexpensive and readable. In some cases, there are additional criteria, such as aquariums where readability must be achieved in darkened rooms despite many reflections (Schiotz, 1981).

Multilingual populations are a special problem. In India, there are over 400 languages and the further complication of a low literacy rate (Das Gupta, 1951). However, dual-language signs appear to be the practical maximum. The Pretoria Zoo places text in Afrikans and English on either side of a vertical column of illustrations. The information provided is selected on the basis of the formal educational program of the South African schools (Smith, 1981).

Still another problem is the tendency of visitors to ignore the signs. Schlegel (1982) suggested attacking the problem by supplementing signs with bulletin boards, information booths, volunteers, slides, films, shows, demonstrations and computers. Many of these ideas already are in place at the Frankfurt Zoo, which supplements its traditional signs with talking labels, graphic designs, revolving globes, slides and sound films (Kirschofer, 1981).

The New York Zoo experimented with cartoons as a possible solution to the problem of unread signs in its bird exhibit (Bruning, 1981). Despite lack of formal assessment, staff have the "impression" that the technique helps. The San Diego Zoo avoids putting species names in sign titles, instead trying to attract attention with titles that are provocative, whimsical, or have double meanings (Bacon and Hallett, 1981).

Most zoos strive for uniformity in their sign system. For example, Edinburgh is developing a dual system of labels. The first, aimed at adults, is of uniform size, background, color, lettering, and method of framing. Illustrations depict the animal in its natural habitat. Information on food, behaviors, distribution, gestation or incubation, and number of young always is included. The second, aimed at children, are placed at the eye-level of 6-7 year olds, on a different color background (Ollason, 1981).

In contrast to this intentional uniformity, the Honolulu Zoo is trying to combat fatigue and boredom by varying its signs as much as possible in format and content. Shape, texture, materials, lettering and angles vary. Some are humorous, and some are manipulable, allowing visitors, for example, to "design a bird" by giving it bill, feet and wings for particular needs. Ecological, behavioral, and other topics are addressed (Throp, 1975).

Signs are such an obvious and important part of educating visitors that they have been the subject of considerable research. Serrell (1981) used a classic treatment-control group design to compare old and new labels on dimensions such as holding power. Gerace (1980) found that sign placement affected how often signs are read. Churchman (1985) has suggested that species popularity, presence of baby animals, animal activity, sign length, sign reading level, and visitor fatigue all impact on the degree to which signs are read, and now is conducting studies to test these hypotheses.

After observing people in museums over seven-day spans, 4-5 hours a day, Wolf and Tymitz (1978) report that visitors not only read, but often search for signs, that almost all visitors read some signs but that they read different kinds of things on the signs, and that that no visitor reads all of them. Excluding infants who cannot read, about the only people who read no labels were those who do not speak the language in which the signs are presented.

It is apparent from this that signs should present varied information--scientific, practical, descriptive--to meet the needs of different visitors. Pedagogical theory suggests that labels proceed from simple to complex. But, label content must be altered more than in terms of specificity alone. Labels at the first level might describe and also identify to stimulate. Labels at the second level might include another kind of learning vehicle such examples or questions. Labels at the third level might state the directions of scientific research or present controversies in the research (Wolf and Tymitz, 1978).

Research, philosophy, experience and classical rhetorical devices have been synthesized at Monterey Bay Aquarium. Consideration of visitor attention span, visual capacity and learning modes have led to specification of three types of sign, with rules for each regarding total length, characters per line, character sizes and colors. Beyond these technical specifications, signs must meet requirements such as communicating one idea well and

describing features a viewer can see easily only if its function is explained. Usage, style and tone all are matters of policy: signs tend to be in informal conversational English; use the active voice; and take a friendly, vivid and light but not flip, conversational tone. They aim to impart a feeling, transmit excitement or pleasure. Style emphasizes wordplay, including all the figures of speech (alliteration, assonance, onomatopoeia, parallelism, antithesis, metaphor, simile, polyptoton, puns) providing meaning is not sacrificed. Devices such as use of the second person, or asking questions are used to involve the visitor (Rand, 1986).

Publications

Zoos are interested in providing visitors more information than they will read from signs. The solution at the Copenhagen Zoo has been to keep signs brief and interesting but to provide two guide books for interested visitors. One is a pocket book of systematic biology. The other contains basic facts and short anecdotal material that answers common questions asked by visitors (Poulsen, 1974).

In addition to guidebooks, zoos publish visitor maps, newsletters and magazines for members, and research reports. But, other than the item just cited, no effort at description or analysis has been identified in the literature.

Libraries

Finally, slightly over 100 US zoos maintain book collections, although only about 40 meet the formal definition of a library and only 10 are staffed full-time by trained librarians. Collections cover topics such as zoology, animal behavior, conservation, ecology, zoo management, zoo design, pathology, veterinary medicine, nutrition, botany and horticulture. Aquarium libraries are even more specialized, and have collections that emphasize such topics as seashore biology. Two zoo libraries have map collections, many have slide or photograph collections and several have reprint collections. Many keep archival materials such as keeper diaries. A few circulate notices to alert staff to relevant journal articles, a few are computerizing their catalogs and a small number have access to bibliographic searches on DIALOG. The librarians have a special interest group within AAZPA and a newsletter that has been published three times a year since 1982 (Kenyon, 1985).

FACTORS AFFECTING EDUCATION IN ZOOS

Attendance Levels

Researchers have focused on six factors that affect the educational impact of zoos. The most basic information is how many visit and how attendance levels can be predicted. The popularity of zoos cuts across all ideological boundaries: they are incredibly popular in capitalist, communist and third world countries. It often is pointed out that more people visit zoos every year in the United States than the combined attendance at professional baseball, basketball, football and hockey games. Mathematical models can help to understand and estimate zoo attendance, and require surprisingly few, easily quantifiable, variables to account for 80% of the variance. Useful additional variables, not necessarily easily quantified such as measures of exhibit quality, seasonal constraints, advertising budget and

parking facilities, may substantially improve even this level of accuracy (Gillett and Allen, 1987).

Demographics

Numbers alone do not answer such questions as how often people come to zoos, or what they have in common. Wolf and Tymitz (1980) interviewed 743 visitors to the Hirschorn and determined that more females than males visit the museum, that most Black visitors did not live in the area but most White visitors did. Similarly, Shettel (1976) found that the "Man in His Environment" at the Field Museum in Chicago tend to attract young white adults and mixed males and females, primarily from suburban Chicago or from out of town, and that they came to the museum with most of the knowledge and attitudes the exhibit tended to impart. Linn (1981) suggests, in connection with the issue of whether or not visitors should be recruited, that it would be useful to know something of who does not come.

Hill (1971) interviewed 1000 groups consisting of 3562 people to determine the demographics and other characteristics of recreational visitors to the San Diego Zoo. Most were young, well-educated, middle class and with members of their nuclear family. One-third were visiting the San Diego Zoo for the first time; 42% had visited other zoos in the previous two years. Visitors living in San Diego averaged one visit every 1.83 years; those from southern California averaged one every 3.05 years and the mean for out-of-state visitors was one every 4.01 years. In a similar study, Reed and Mindlin (1963) determined on the basis of a sample of 467 people interviewed on four days (one Saturday, one Sunday and two randomly selected weekdays) that about half the visitors to Washington's National Zoo came from the city or its surrounding metropolitan area, and the remainder came from through the US.

Utilization Patterns

Third, researchers have addressed the question of how people utilize museums or zoos. Wolf and Tymitz (1978) have approached the issue by developing a taxonomy of four visitor types. These are the "commuter" who was on the way to somewhere else, the "nomad" or casual visitor, apparently open to becoming interested in something without knowing what or quite why he was there, the "cafeteria type" who apparently wants to get interested in something and treats the entire museum as a cafeteria, and the "Very Interested Person" who arrives at the exhibit with some prior interest, and who goes through the hall more carefully than others. They argue that it is inappropriate to say that the exhibit was "better" for the VIP than the others. Exhibits should not appeal only to one kind of visitor: the possibility of stimulating all is important. As Linn (1981) points out, a museum--or zoo--is not like a school. All people do not begin with the same level of knowledge or with the same interests, nor must they all learn the same thing. They do not report where the commuters were going, or the proportion of visitors in each category and there seems to be little if any difference between "nomads" and "cafeteria types." Linn (1981) has suggested that it may (or may not) be appropriate to learn why people do not come to museums. Kinard (1977) also argues the need to "discover the aspirations, hopes, desires, quests, ambitions, dreams and problems of nonvisitors," although his rationale is based on counterculture notions that have faded in popularity.

Movement Patterns

Fourth, researchers have addressed the way visitors move through museums and zoos. In a series of studies, Melton (1935) discovered a number of generalizations about visitor movement in exhibit halls. The most basic is a right-turn bias, which can be slightly modified by placement of exits and can be overcome by signs whose effectiveness declines rapidly with their distance from entry doors. The bias cannot be overcome by changes in what is exhibited! Therefore, understanding patterns of visitor movement is useful in planning exhibits for maximum effectiveness. It should not be too surprising that the right-turn bias is not as strong as a down-hill bias where visitor paths are not entirely level (Churchman, 1984). These and other factors appear to influence large proportions of visitors to follow similar routes regardless of the exhibits themselves (Andrade, et. al., 1985).

One critical area of need is systematic study of visitor response to controlled variation of exhibit components. Research of this sort would clarify what factors contribute to measurable cognitive gains, help us to understand the nature of visitor reactions, to explore the instructional effectiveness of different types of exhibits, to appreciate the dynamics of visual and interactive learning and to incorporate this understanding into exhibit planning and design. Cameron and Abbey (1961) argue that generalizable knowledge is needed about visitors' retention (facts), comprehension (ideas), organization (relationship of facts), incorporation (assimilation of facts and ideas) and communication (ability to pass the message on to others). Borun (1977) points out that such knowledge requires comparative studies using data collected in a range of institutions, to distinguish general principles from the effects of specific museum contexts. Bitgood has conducted studies involving systematic change in factors such as lighting levels. Both Bitgood (1987) and Churchman (1987) are conducting comparative studies across zoos that are remarkably similar in their methods, so have important potential for meta-analysis.

While some researchers have tried only to understand factors influencing visitor movement, others (including Melton) have explored ways to control or at least influence it. Lime (1975) has developed a useful system for classifying techniques for managing user behavior. As he had facilities such as national parks and forests in mind, relatively few of his specific control techniques may apply, but the concepts are adaptable to zoos and the methods provide a useful frame of reference in selecting approaches to specific problems. These include three "indirect" methods of "site management," including hardening (installation of durable surfaces, conversion to more hardy species, revegetation, etc.), channeling users (erecting barriers, constructing paths, landscaping) and facilities development or alteration (providing access to underused areas, enlarging or reducing parking lots, provision and siting of concessions and provision of interpretive facilities). Two "indirect" methods of influencing visitor behavior are information (advertising attributes of the area, educate users to basic concepts of ecology, advertising underused areas) and pricing systems (differential fees by season or other variable, market clearing pricing by adjusting prices till desired use level is maintained). Lime suggests five methods of direct regulation including zoning, restrictions (rotate use by opening or closing access points, require reservations, limit group size), eligibility (skills, membership), restricting activities (campfires), and enforcement (staff presence, surveillance, fines, ejecting violators).

Temporal Patterns

Fifth, researchers have addressed the way visitors use their time at museums and zoos. Wolf and Tymitz (1980) found that most visitors to the Hirschorn spend at least two hours in the museum, while a small proportion spend as much as four. Similarly, Falk (1982) reported average time spent in museums by visitors was two hours, but that and only about 30 minutes were spent viewing exhibits. Duration of visits is affected by factors often overlooked by museum staff, such as parking meter limits, bus schedules, hunger, fatigue, lunch hours and appointments.

Some visitors see a large number of exhibits quickly, others concentrate on a smaller number. That is, at any one exhibit, time is bimodally distributed and means are misleading indices (Falk, 1982). Wolf and Tymitz (1978) observed that pairs were more attentive than individuals or groups of three or more, and that the number of people in an exhibit area affects the speed with which later arrivals move through it. Andrade, et. al. (1985) tracked 16 groups for their entire visit to the Los Angeles Zoo. Visits averaged nearly three hours. Mean time spent viewing and walking among exhibits was 127 minutes, eating 20 minutes and other activities 21 minutes. Comparable means at Melbourne Zoo were 127, 27 and 9 minutes (Churchman, 1987).

Social Patterns

Fifth, Loomis (1974) argues that more information is needed about the social nature of museum visiting, and that innovative strategies in evaluation and some kind of theoretical framework are needed as well. Traditional experimental methods utilizing treatment and control groups are totally inadequate to such studies because of the number of variables affecting social settings and the large number of interactions (in a statistical sense) among them (Campbell, 1973), which force alternative methods based on observation in natural settings on researchers (Cronbach, 1975). Graburn (1977) approaches this issue from the perspective of the structural anthropologist, arguing that the museum visits mark personal and family life in a memorable way, and make contrasts with work and home that are important in contemporary western culture. Beyond these "associational" functions, he argues that families seek "reverential" and "educational" experiences but that the role of museums (and zoos) with respect to them is ambiguous. Evidence supporting--and qualifying--this view comes from a study of a formal course in animal behavior offered by the Minnesota Zoological Gardens in which adults found the family-oriented parts of the course the most rewarding (Gennaro, et. al, 1980). Wolf and Tymitz (1979) conducted over 300 interviews at the National Zoo, determining that people came to the zoo for mental and physical relaxation, entertainment, education, and as a family tradition.

Recognition of the social and recreational agenda of family visitors led the National Zoo to develop HERPlab, which stresses hands-on involvement and interaction through materials geared to family groups (White, 1983). Similarly, the Shedd Aquarium found that family members interact with each other more than they attend to exhibits, exploring on a general basis until an exhibit catches the interest of a single member on which all then concentrate. They too implemented programs to achieve educational goals by building on these visitor characteristics (Wilson, 1981).

Need for Research

Cameron and Abbey (1961) noted the irony of a profession peopled with scholars that lags behind business in employing the social sciences to understand its market. They suggested that this reflected lack of funds, lack of people qualified to design and carry out such studies, failure to publish those that are done, and condescending attitudes of academics toward studies that sound like those conducted on Madison Avenue. Monroe (1977) suggests slightly different reasons for the lack of research, including a long association with the social and educational elite, a tradition which has stressed repository, research and preservation, lack of adequate financial support, and a proliferation of small museums capable of only the most rudimentary operations. But these factors are changing and the quality and value of visitor experience is becoming a fundamental concern. Several corollaries can be extracted from this axiom: the need for systematic feedback from visitors; the need to understand why visitors learned from, enjoyed and appreciated exhibits; the need to involve many disciplines in exhibit design and the necessity to define objectives to assure integrated exhibit design.

Washburne (1975) asserts that the collection and preservation function is not sufficient justification for the existence of museums and that they have not met their educational responsibilities because they have failed to prove that they are being achieved. Screven (1976) and others point to the practical information researchers can provide to those responsible for designing exhibits in zoos and museums.

The assumption that increased attendance indicates effectiveness is unwarranted in view of contrary explanations such as increased leisure, higher levels of average educational achievement and greater mobility (Monroe, 1977) Rather, visitor research requires well-defined foci, such as effects, limits and opportunities on visitor perception of architecture and the environment; multiple pathways and levels through the same exhibit for differing visitor interests; identification of design techniques that enhance or obscure visitor awareness of themes, concepts and ideas; and effectiveness of didactic material such as labels, handouts, and graphics (Frye, 1977).

Approaches to Research on Visitors to Zoos

The dominant approaches to conducting research on human behavior and learning today are experiments. Peart (1984) studied the effect of five variations of the same exhibit to determine which had the greatest effect on knowledge gain, attitudinal change, attracting power, holding power and interaction. Kimmel and Maves (1972) used multidimensional scaling to identify visitor response to systematic changes in museum characteristics such as color, lighting, labelling, number and placement of objects and size and complexity of exhibits.

Despite the dominance of multiple case or comparison group designs, it is worth remembering that experimental psychology originated in single case designs in the work of Wundt, Pavlov and Thorndike. The fundamental requirement is repeated observations over time. Single case designs are relevant when questions can be answered by frequency measures, rate of response, endurance of response, and the like. Observations can be natural or

contrived, field or laboratory, obtrusive or unobtrusive, and often involve alternating baseline and intervention conditions. The order, number of repetitions, and number of interventions can be varied. Data can be analyzed by t- or F-tests to detect differences when separate phases can be identified. Regression and related time-series methods can be used if the data shows serial dependency. Randomization tests can be used when the treatment can be implemented and withdrawn repeatedly. Rank tests can be used with the influence of intervention on behaviors is examined (Kazdin, 1982).

The most common alternative to the experimental design is survey research. For example, approximately 50000 postcards were received at London Zoo in response to a televised request in which young viewers were asked to vote for the animal the liked most and least. Of these, a sample of 2200 (100 boys and 100 girls from each age group between 4 and 14) were examined. Animals disliked included snake, spider, lion, rat, crocodile, skunk, gorilla, hippopotamus, rhinoceros, and tiger. Animals liked were monkey, chimpanzee, horse, bushbaby, giant panda, bear, elephant, lion, dog and giraffe (Morris, 1960) This study was replicated in Czechoslovakia with similar, but not identical, results. Least liked animals were snake, rat, wolf, lion, mouse, polecat, fox, frog, tiger and crocodile. Animals liked were monkey, dog, parrot, bear, chimpanzee, doe, horse, cat, stag and lion (Surinova, 1972).

Surveys also have been used in combination with visitor tracking in zoos and museums. For example, Kwong (1976) combined trackings and interviews to determine that signs in the lion-tiger exhibit at the National Zoo were read more often if they also had photographs. Wolf and Tymitz (1981) used this approach to determine the general pattern in which visitors moved through an exhibit hall, noting "magnet areas" where individuals tended to linger, and concentrating their interviews on visitors leaving these, and on observing and interacting with persons during their visit. Cave and Wolf (1983) assessed effectiveness of Smithsonian Natural History Museum exhibits using unobtrusive observation of a stratified random sample of 200 visitors, 80 of whom were later interviewed.

Despite the general dominance of experiments and surveys they are difficult to do well and effectively in zoos. Random selection is difficult to achieve except under special circumstances and many studies have depended on volunteers, severely limiting the reliability and validity of the results. Manipulating independent variables often requires nothing less than redesigning exhibits, both administratively difficult and prohibitively expensive. Such research often depends on volunteers to complete questionnaires, interviews or tests. But volunteers will not take more than a few minutes or complete tests that may expose ignorance. They are obtrusive and may be reactive--that is, they may change as well as measure behavior. Thus, it is not surprising that Clowes and Wolff (1980) report that traditional pre- and post-test procedures were not particularly successful in obtaining data from recreational visitors. Wolf and Tymitz (1978) suggest limiting interviews to mornings--an important limitation on the method that builds an acknowledged bias of unknown direction into the results that then is likely to be overlooked in interpreting or generalizing from them, so a very dubious idea. Bitgood and Richardson (1987) have demonstrated that visitors are only about 60% accurate in retracing their path through a zoo, and tend to overestimate the duration of time they spend in their visit.

Screven (1976) approaches the problem from still another perspective, that of the applied researcher or evaluator. In his view, the major focus of research requires specifying the desired impacts in advance in measurable learning or performance outcomes, planning exhibits to achieve the desired impacts, collecting research data to determine if the desired impact has been achieved, and revising as necessary. For example, Cone (1978) determined that actual movement of visitors through an anthropology exhibit did not correspond to the logical sequence planned by museum designers.

Rosenfeld (1979) argues that this failure stems from professionals attempting to impose their own goals on visitors, rather than finding our what interests them. His cure is "naturalistic" evaluation that seeks to understand how visitors direct and organize their own experience, what factors relate to informal learning, what their criteria are for a successful visit, how they define learning, and what is important to them. However, this is not the only approach to conducting such needs assessments, as attested to by a large literature on the subject, including Rossett and Smith (1981) and Churchman (1978).

More generally, it seems wisest to treat methods as means to an end. A method should be selected much as a carpenter chooses between a cross-cut or a rip saw, to achieve a purpose in a specific situation. Thus, Pearce and Moscardo (1985) argue for more imaginative use of alternatives to the visitor survey such as simulations, participant observation and unobtrusive or nonreactive measures (Webb, et. al., 1981).

Nonreactive measures, requiring deduction from observation of behavior and traces of behavior, mark the approach Sherlock Holmes might take if he had been a psychologist. While no more capable of answering all research questions than any other method, they do have some particularly attractive features for those interested in the educational impact of zoos. Foremost among them is collecting data without interfering with visitors who have come to the zoo to relax, not to serve as the subjects of experiments. Equally important, they permit random sampling with 100% response rates! The price paid for such gains often is tremendous effort in collecting data and great ambiguity in interpreting results.

But, practical and technical problems of tests, interviews, questionnaires and similar interventionist strategies limit reliability and validity of data collected on zoo visitors, suggesting exploration of the potential of non-reactive methods. They are particularly well adapted to assessing such issues as utilization levels of areas within a zoo, determinants of holding power of exhibits, attitudes toward .PA animals, sign-reading, and social interaction among visitors (Churchman, 1984, 1985).

The three major types of nonreactive measures are observation, records and physical evidence. The latter usually is divided into erosion and accretion measures. An effective erosion measure reported by Hoppes (1985) is the disappearance rate of pads of paper provided to enable visitors to write down the addresses of conservation organizations measure the effectiveness of an exhibit on endangered species. An accretion measure illustrating that the same variable--interest--can be measured in several ways, is the rate at which exhibits were photographed (Wolf and Tymitz, 1981).

An example of nonreactive observation is tracking of visitors in the National Zoo's reptile house after new signs were installed to determine time spent at exhibits, number of exhibits at which visitors stopped, and number of signs read (Marcellini, 1976). Visitors to museums and zoos have been followed to determine their routes, counted to determine exhibit popularity, timed to determine whether exhibit signs are read, and eavesdropped on to determine attitudes toward animals and one another (Churchman, 1984).

A possible use of records is determining the popularity of species on the basis of book sales from zoo souvenir shops, or of the impact of temporary exhibits from temporary fluctuations in long-range attendance figures. No specific examples of such research dealing with zoos have been identified.

It is worth noting that such methods generally do not violate federal codes for the protection of human subjects (45 CFR 46), nor most university ethics codes which are based on them. Basically, collecting data on behavior in public places does not require consent or notification of subjects if (1) there is no manipulation of behavior and (2) no data can be traced to specific individuals. Those unfamiliar with these regulations or proposing unexcepted research should of course submit planned research to appropriate Institutional Review Boards.

But, Zyzkowski (1981) warns that unless care is taken in their design, such naturalistic evaluations often prove pointless, ambiguous, expensive, and threatening. In this school of thought, measures such as attracting and holding power often equated with a successful exhibit are only prerequisites to learning (Screven, 1979), bringing the argument full circle. Similarly, Pearce and Moscardo (1985) argue that , although there is room for both theoretical researchers, who must ask whether their study unambiguously tests relationships among variables; and for applied researchers who should aim to avoid reactivity so that their results explain normal behavior, it is vital that research have specific purposes. If it is aimed simply at "understanding the visitor," it is almost certain to be uninformative, expensive and wasteful.

Conclusion

It is apparent from the preceding that the educational impact of zoos and museums offers fertile and important ground for researchers. Coverage of topics is uneven, underlying theoretical dimensions are poorly identified, and much of the literature that does exist is descriptive. The research that has been reported appears almost (but not quite) exclusively in journals and conference proceedings associated with zoos and museums rather than those of major disciplines such as psychology and sociology. Most of the studies involve small numbers, instruments of unknown reliability and validity, and data that cannot be generalized confidently. Despite this, the methodological challenges are interesting, and the substantive issues are well-defined and theoretically important to broader concerns such as nonformal education, leisure, and sociology of the family to warrant much greater attention than has been given to the educational role of zoos. Here and there, zoo and university researchers are taking up these challenges.

ABSTRACTS

The following section provides abstracts of about 400 items published in English between 1928 and 1987 that pertain either to visitor behavior, education, or related research methods.

Although the purpose in reviewing this literature was to synthesize the literature on zoos as educational institutions, many items dealing with museums are included. There are three reasons for this. First, the issues and methods of zoo researchers were strongly influenced by this literature. Second, there are gaps in the research on zoos for which the literature from museums provides important information. Third, zoos increasingly are borrowing from museums in developing their exhibits, and some authors are beginning to argue that separation of these institutions is archaic.

Systematic research on the educational role of museums, zoos and aquariums may be said to begin with the visitor studies of Robinson (1928) and several studies by Melton in 1935. By 1964, a comprehensive "Chronological Bibliography of Museum Visitor Surveys" required only three pages in Museum News (de Borhegyi, 1964). Eleven years later an annotated bibliography covering both museums and zoos required 36 pages (Elliot and Loomis, 1975). In the same year, a bibliographic review gave some order to this literature by reviewing it under eight broad headings (Borun, 1975). Twelve years later, and sixty years after the studies of Robinson, the literature has expanded to the point where a bibliographic review is again warranted.

Many of the papers are hard to find. Some--usually the first one where I found an idea addressed--are cited in the synthesis. Items cited in one section of the synthesis often allude to other topics. Some people are interested in the literature for quite different reasons, and will find my categorization inappropriate to thier needs. For these reasons the complete set of abstracts is provided.

Citations only are provided for about 50 items. Most were identified but never obtained. The rest are citations for peripheral issues mentioned in the review. Most of these are methodological works of potential use in designing research or interpretive works pertaining to the relationships between animals and human culture.

Many of my students helped to identify and obtain the original articles, and others drafted a substantial proportion of the abstracts. Among them, Steven DePiazzy deserves special mention for his efforts and dedication. Judith King of the National Zoo saved at least six months (of two years spent on the project) by obtaining many of the items from the Smithsonian Institution.

Abler, T., n.d. Traffic Pattern and Exhibit Design: A Study of Learning in the Museum. Milwaukee: University of Wisconsin. Masters thesis reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

Testing of museum exhibits provides a way to determine what techniques of museum education are effective, and can reduce speculation about exhibit effectiveness, but will not eliminate the need for creativity in developing the exhibits themselves. A single exhibit was changed, one variable at a time, and the visitor's reaction to the change determined by questionnaire and by observation of traffic patterns. The potential contribution of carefully planned visitor research studies to exhibit design is advocated.

Adams, L. and D. Leedy, 1987. Integrating Man and Nature in the Metropolitan Environment. A Symposium. ?: National Institute for Urban Wildlife.

Aiello, J., 1984. Education as a Major Component in Planning a Zoo. Newsletter: International Association of Zoo Educators. 12.

The Burnet Park Zoo, Syracuse, NY, is being completely renovated and organized around three main themes, each subdivided into exhibit complexes to present concepts in understandable form. Species inventories, graphics, texts and programs are being developed to enhance the thematic concepts:

1. Evolution of Life on Earth. Animals in antiquity (invertebrates, fishes, insects, amphibians, reptiles and primitive mammals) traces life from beginnings in water to about 150 million years ago when we think birds evolved. Animal diversity focuses on birds, emphasizing the way different species find food, avoid danger, raise young. Animal adaptations demonstrates easily seen adaptations to specific environments (e.g. river otters to water, sloths to trees) and the role of adaptations to survival. Animals as social beings treats socialization as an adaptation for survival and exhibits animals with colonial or group social structures (e.g., lions, baboons, bees, weaver birds, hyrax).

2. Wild North. This 26 acre exhibit is intended to explain the balance of nature as exhibited in four North American biomes: arctic tundra, western highlands, eastern deciduous and western grasslands. Concepts include the fragility of environments, the importance of animals to overall balance; natural change in environments; and the necessity and ability of animals to adapt to change in order to survive. Animals are exhibited in increasing order of human impact including endangered (e.g., eagles, mountain lions) and extinct animals (a quiet place to induce visitors to think of what has been lost) and the role of zoos in conservation.

3. Animals and People. This area includes exhibits on animals benefiting people (the story of domestication including artificial selection and ways domestic animals serve people) and People benefiting animals (how zoo provides for animals--diet preparation, veterinary care, nursery, etc.)

Anderson, L., 1986. The New Childrens' Zoo at Copenhagen. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Since modern children have little knowledge of domestic animals, the childrens zoo at Copenhagen has been designed to increase understanding of our dependence on them. Role play is sued to develop an understanding of an animal's way of life and survival needs. Children care for and manage the

stock and short labels directed at adults is provided to initiate dialogue between adults and children.

Anderson, S., 1968. Noseprints on the Glass: Or How Do We Evaluate Museum Programs?," in E. Larrabee, Museums and Education. Washington, DC: Smithsonian Institution Press.

Strategies and problems in evaluating the educational impact of museum settings, with an emphasis on traces left by visitors that can be used as unobtrusive measures.

Ashton, R., 1984. ZATA Educational Program Activity Oriented Expeditions. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Birmingham, Alabama.

The Zoo and Aquarium Travel Association's goal is to promote conservation through educational travel involving field research on the world of nature and are open to any zoo. Programs are designed to enhance existing programs at zoos and are designed for teens; docents, staff and teachers; and families.

Bacon, J. and M. Hallett, 1981. Exhibit Systems for Reptiles and Amphibians at the San Diego Zoo: Dioramas and Graphics. International Zoo Yearbook, 21. London: Zoological Society of London.

The sign system at the San Diego Zoo is slanted to allow several people to read each one simultaneously, and consists of translucent plastic with black letters and fluorescent backlighting. Text usually emphasizes a single point about the species, some higher taxon of which it is a member, or concepts such as conservation, preservation or legislation. Titles that are provocative, whimsical or have a double meaning may be used to attract the visitor; for the same reason, species names appear in the text rather than the title.

Naturalistic exhibits, consisting primarily of a combination of natural materials and mural backgrounds, must consider the biological needs of the animals; the viewing and educational needs of the public and the safety and convenience of the keepers and costs. Naturalistic exhibits are less safe and compromise in naturalness may be required, which raises the issue of just how honest natural exhibits really are. And, such exhibits are harder to clean and more likely to harbor parasites and other hazards. On the other hand, the natural exhibit is supported by five arguments.

First, educational value is enhanced. Visual cues help viewers associate the animal with its ecosystem and help them to understand anatomical, physiological and behavioral adaptations, and reduce the amount of text required. Second, it meets the environmental needs of the animals (the microprocessor controlled enclosures at the Roeding Park Zoo in Fresno provides microclimates varying in temperature, light and humidity in relatively small enclosures, so that daily and seasonal cycles can be simulated). Third, viewer boredom generated by repetitious enclosures is reduced. Fourth, well-executed and well-maintained naturalistic enclosures are aesthetically pleasing. Finally, they may assuage our consciences as keepers of animals.

Balling, J., J. Falk, and J. Liversidge, 1985. Strategies for Enhancing the Educational Value of Family Visits to a Zoological Exhibit. Washington, DC: Smithsonian Institution.

This study sought to design and test two brief orientations for family visitors to the small mammal house; to determine whether social and physical needs of families influence their behavior, learning, and satisfaction with the small mammal house; and to describe difference in the behavior of families with different-aged children who visit the small mammal house.

Families were given either an abstract or concrete orientation, or no orientation, to the small mammal house as they entered. Measures included behavioral observations, interviews, visual learning tests, and self-selected booklets containing several kinds of family activities.

Families spent between 3 and 25 minutes in the small mammal house, averaging 13.03 minutes. Families with toddlers spent the shortest time in the exhibit. Non-verbal behaviors such as looking, pointing and reading signs were more common than verbal behaviors. Twenty-six percent of those interviewed were tourists; average family size was 3.5 and reported length of stay at the zoo averaged 88 minutes. Although only 38% were observed reading signs all reported that they read something of the signs.

Bart, W., Summer 1972. A Hierarchy Among Attitudes Toward Animals. The Journal of Environmental Education 3.

A hierarchy of attitudes toward various animals was constructed on the basis of a survey given to college students. Bart suggests that developing positive attitudes toward animals at the bottom of the hierarchy will positively affect attitudes toward animals higher up, and that positive attitudes toward higher animals are prerequisites to positive attitudes toward animals lower down. Urges that school curricula should be developed that take these sequences into account.

Bartov, H., 1981. Teaching Students to Understand the Advantages and Disadvantages of Teleological and Anthropomorphic Statements in Biology. Journal of Research in Science Teaching. 18.

The ability of secondary school students to differentiate between teleological or anthropomorphic formulations and factual explanations is poorly developed. Discusses implications for teaching of biology.

Baskin, B., 1977. Evaluation, Seminar Style: A Time to Articulate Experience, Share Ideas, and Plan Improvements. In Program Planning Committee, The Visitor and The Museum, Berkeley, CA: Lowie Museum of Anthropology, University of California.

This study originated in observations that art museum visitor comments tended to be personal, non-aesthetic and sentimental. From this it was concluded that social talk is the overriding language of museum visitors and that most visitors regard paintings as pictures of something and find pleasure in verisimilitude and charm of pictorial details and derive meaning through personal memories they associate with the picture. Rarely do they attend to the expressive visual messages that transcend the content, yet it is precisely these more universal, uniquely artistic sources of meaning that museum educators want to open to visitors.

Teaching these broader concepts cannot be standardized. Consequently,

tour leaders must constantly evaluate (1) the object--its nature and meaning, (2) the visitors--their interests and responses and (3) the educational program. At Berkeley, all tours are systematically evaluated through observations and through questionnaires. But, the most direct and productive method for evaluating tours is simply to discuss them among tour guides for 30-60 minutes. The sessions are aimed at pooling insights and experiences to improve the ability of guides to deal with the wide variety of interpersonal problems within visitor groups, and varied backgrounds, attitudes and interests encountered.

Bechtel, R., 1967. Hodometer Research in Museums. Museum News 45.

The Greek word "hodos" , meaning pathways, leads to the term hodometer, an electrical grid for recording footsteps in a room. The system employs electrical contacts under mats which operate counters. Footsteps are recorded and identified as to location and number on data sheets. The researcher is able to identify the volume of visitor traffic related to any object. The method is limited to indoor facilities.

Berkovits, A., 1976. The Effect of Three Different Educational Approaches on The Cognitive and Affective Learning of Urban Students in a Zoological Park. New York: Manhattan College (unpublished masters thesis).

This study sought to determine which of three approaches was most effective in teaching simple ecological facts and conservation concepts to urban students visiting a zoological park. The approaches included (1) a traditional lecture augmented with a film and a live animal demonstration, (2) an inquiry group, stressing discovery in small groups receiving a 45 minute tour by a trained volunteer and (3) a self-directed tour relying on graphics and curiosity.

No significant difference in affect was found among the approaches, but the traditional method was marginally more successful with respect to cognitive learning.

Berkovits, A., 1984. Evaluation: A W.I.Z.E. Investment: Wildlife Inquiry through Zoo Education. Paper presented at the meeting of the International Zoo Educators Association, Edinburgh, SCOTLAND.

Berkovits discusses the role of evaluation in general and to the W.I.Z.E. program in particular. Potential benefits and problems are detailed and the value and impact of evaluation on the future of a project, particularly its funding, are detailed.

W.I.Z.E. is a three year collaborative effort among 4 zoos aimed at developing a coherent program of over one hundred lessons in zoo biology, behavior, and wildlife conservation, geared to a middle school audience.

Major questions addressed were:

1. What limitations does the budget have on the project?
2. What scheduling conflicts are effecting the project?
3. What is the material production schedule?
4. How committed are project participants?

The distinction between summative and formative evaluation was made in terms of the primary audience, the former aimed at funding sources who are concerned with final outcomes; the latter aimed more at project staff who required feedback to improve the project.

Evaluators may be either insiders, regularly employed by the organization

and assigned to the task, or outsiders, employed specifically to complete the evaluation. Factors in selection include familiarity with the organization, and objectivity. A contract spelling out expectations is vital when working with an outside evaluator.

The choice between use of existing instruments and development of instruments for the project is another important decision. Cost, reliability, and validity are important factors in making the choice.

The final report must be suitable to the purpose of the evaluation, whether formative or summative.

Bettelheim, B., 1976. The Uses of Enchantment: The Meaning and Importance of Fairy Tales. New York: Knopf.

Birney, B., M. Wood, and D. Churchman, 1986. Development of Animal Behavior Studies for Elementary School Children. Paper presented at the annual western meeting of the American Association of Zoological Parks and Aquariums, Tacoma, WA.

A National Science Foundation grant (DPE 840035) supported adaptation of nonharmful experiments on animal behavior for use in elementary school classrooms to enhance student knowledge of animal behavior and scientific procedure.

A manual was drafted, reviewed by two ethologists, revised, field-tested with six groups of grade 3-4 and 5-6 students, and revised again. The completed manual includes 1 fish, 4 amphibian, 6 reptile, 7 bird and 7 mammal experiments. Each specifies the purpose, recommends student group size, and lists needed animals, equipment (an appendix describes how to make anything needed) and forms (an appendix includes both blank forms for student use and completed forms for teacher use). The next section guides teachers in helping students to develop their own hypotheses. The procedures section guides the teacher in supervising the experiment; the results section helps the teacher guide students in summarizing what actually happened; and the discussion section helps the teacher guide the students in interpreting results. Provision is made for experiments that do not work as planned. A simplified set of instructions for each experiment is provided for students.

Each experiment contributed to accomplishing the first goal, but any five experiments exhaust the potential of the experiments for accomplishing the second goal. Field-testing also demonstrated that the experiments were suitable for 5th-6th grade students, but not for 3rd-4th grade students, who were less able to tolerate the ambiguity of tasks that lacked predetermined "right" answers.

Birney, B. and S. Shaha, 1982. Dosage vs. Distribution: The Support of Docents on Zoo Visitors Acquisition of Knowledge. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Phoenix, AZ. ED 226 995.

Docent-guided zoo visits have significant impact on visitor knowledge concerning relatively unfamiliar animals such as cavies and tapirs, but no significant impact on visitor knowledge concerning either moderately familiar or very familiar animals such as chimpanzees, polar bears, raccoons and badgers, when compared with visitors who read signs or visited unsigned exhibits.

Birney, B., 1987. National Survey of Conservation Programs. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

One hundred eighty four AAZPA member institutions were surveyed to determine characteristics of their conservation programs, if any. Responses were received from 74 institutions, 16 of which reported having no programs directly targeting conservation issues. Results are presented in 20 tables covering such topics as type of staff who conduct programs, length of programs, program formats, demographics of participants on- and off-site, special exhibits, and conservation days.

Bitgood, S. and D. Thompson, Fall 1987. How Do People Perceive Museums, Parks and Zoos? Visitor Behavior 2, 3.

In two studies using a 27-item, 7-point, semantic differential, 150 undergraduate and graduate students from Jacksonville State University rated art museums, science museums, zoos, state parks and theme parks.

Zoos and parks were perceived as more childlike, and art and science museums as more adult. Within a much narrower range, science museums were rated as relatively "blander," and zoos and theme parks as relatively "spicy." Museums were perceived as more "formal" than zoos or parks. Zoos were perceived less "complicated than science or art museums, as "complicated" as theme parks, and more "complicated" than state parks. Finally, parks and zoos were perceived as more "fun" than museums.

In a followup to this study, 74 of the original participants visited a local natural history museum and completed the semantic differential again, rating only the science museum. Ratings changed in a positive direction (more adult, spicy, informal, simple, and fun).

Bitgood, S., et. al., 1985. Lighting Up: Visitor Reactions to Illuminating Level in a Cave Exhibit. Unpublished?

The purpose of the study was to determine the level of lighting that produced the longest viewing time and the greatest visitor satisfaction. Visitors to the Anniston Museum of Natural History were timed and tracked from the time they entered till they left a simulated cave. Their comments were recorded. A sample of those observed were interviewed after leaving concerning lighting, temperature, viewability, crowding, noise, educational value and attractiveness of the exhibit.

Visitors were exposed to one of three levels of lighting: .012 foot candles (n = 112) , .030 foot candles (n = 94) or .089 foot candles (n = 135). Shortest viewing time (mean = 77.3 seconds) was associated with the low lighting, while medium level was associated with the longest viewing time (mean = 133.5 seconds) While 54.5% of visitors reported the low light as too dim, only 13.9% did so under medium light. Viewability and ease of understanding also was affected by light level.

Bitgood, S., A. Benefield, D. Patterson, D. Lewis and A. Landers, 1985. Zoo Visitors: Can we Make them Behave? Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Columbus, OH.

Zoos increasingly are concerned about and trying to control visitor behavior to (1) increase attendance by encouraging return visits, (2) increase information and influence attitudes favoring conservation, (3) discourage undesirable behaviors such as feeding or teasing animals or discourtesy to other visitors.

This study assumed that visitor behavior is primarily controlled by three factors: exhibit attractiveness, physical and psychological comfort and types of controlling stimuli provided by the zoo. Ten visitors (half adult, half children) were observed at each of three exhibits in each of six areas of the Birmingham zoo. Response to three types of sign were measured: entrance-exit signs, exhibit labels, and instructions on how to act. Results supported the proposed three factor model. Exhibit attractiveness is facilitated by animal activity, animal size, presence of young animals, and minimal visual barriers. Reduction of visitor congestion by making traffic flow one way increased

viewing time. Entrance and exit signs exerted more control than did stimuli that attempted to influence by giving information or instructions on how to act.

Bitgood, S., D. Patterson, A. Benefield and J. Roper, 1987. Post-occupancy Evaluation of the Predator House at the Birmingham Zoo. Technical Report 86-40. Jacksonville, AL: Psychology Institute, Jacksonville State University.

A postoccupancy evaluation of the predator house at the Birmingham Zoo was conducted using (1) a walk-through inspection to identify potential strengths and weaknesses, (2) direct observation of visitors including data on attracting power, holding power, animal activity, and sign reading, (3) observation of visitors at similar exhibits in other zoos, (4) a survey of visitor reactions, and (4) informal discussions with zoo staff.

Detailed results are presented for each exhibit. Recommendations included improved sign lighting, shortened and rewritten signs with increased letter size, addition of participatory devices, construction of a divider between the river otter and eagle exhibits so that they do not compete with one another for visitor attention, increased seating, and installation of signs explaining absence of some animals or why they may be sleeping.

Bitgood, S., et. al., 1986. Understanding Your Visitors: Ten Factors that Influence Their Behavior. Technical Report 86-60. Jacksonville, AL: Psychology Institute, Jacksonville State University.

Bitgood, et. al., propose ten principles of visitor behavior and the research evidence for each. These principles are: (1) Holding power of an exhibit is positively correlated with animal activity. (2) Holding power is positively correlated with exhibit size. (3) Holding power is positively correlated with visitor participation. (4) Holding power is positively correlated with presence of an infant animal. (5) Attracting and holding power is positively correlated with ease of viewing (impediments to viewing include barriers, glare, hiding places for animals, dirty glass, and distance between visitors and animals). (6) Attracting power is positively correlated with visitor perceptions of species characteristics (two such characteristics are perceived dangerousness and perceived attractiveness). (7) Attracting and holding power of an exhibit depend on visitor fatigue, satiation, and placement of exits. (8) Attracting and holding power of signs is positively correlated with their salience (which is increased by increasing size of the sign and the letters, decreasing the number of words, adding graphics and color, effective lighting, adding another sense modality such as sound, and by placing it in the visual path of the visitor). (9) Attracting power is inversely correlated to the number of visually competing stimuli. (10) Visitor self-reports are not always valid (in particular, don't ask visitors to estimate the amount of time at an exhibit or in the zoo, to retrace their steps, whether signs were interesting unless you know they read the signs, or anything they think you don't want to hear).

Bitgood, S., and A. Benefield, in press. Visitor Reactions to Similar Exhibits Across Zoos. Environment and Behavior.

Comparative visitor data across zoos can provide a normative standard for evaluating exhibits and can give important clues on exhibit characteristics that influence visitor behavior. The current study uses a standard recording procedure to compare visitor behavior in thirteen US zoos. Over 24 species of

animal exhibits were included. In general, 30 visitors per exhibit were observed, divided equally among males and females, adults and children. Exhibits were selected on the basis of species, ease of conducting unobtrusive observation, ease of determining if the visitor was viewing the particular exhibit rather than other exhibits or features of the environment, single species exhibits, frequency with which the species appears in zoos (rare, exotic species were avoided). Percentage of visitors stopping, average viewing time, animal activity level, and presence of infants was determined by observation. Observation times varied from zoo to zoo and exhibit to exhibit.

Among bear and large cat exhibits, viewing time was positively correlated with animal activity. The percent of visitors stopping varied across zoos. Infants also increased the length of viewing time. Among reptiles, the pattern tends to be high stopping rates and short viewing time, due to the relative inactivity of these animals. Viewing time appears to be positively correlated with visitors' perception of how dangerous each species is (but, cobras--large, dangerous and relatively active--produced shorter viewing time than other snakes). Among primate exhibits, viewing time appears to be positively correlated with factors such as ease of viewing through barriers, ability to interact with the animals, and naturalism of exhibits. In general, hoofed animal exhibits produce lower rates of stopping and shorter viewing times. Exhibit attractiveness appears to be a factor in viewing time, while activity level is not as strong a factor as in other exhibits.

Across all species, a correlation of .77 was found between viewing time and animal activity. If this factor is controlled, there is relatively little variability across zoos. A correlation of .88 was found between relative size of animal and viewing time. The presence of infants appears to double viewing time. The percentage of visitors stopping appears to be inversely correlated with the distance between the animals and the visitor, although this finding is based on a single exhibit at a single zoo and obviously requires further study.

Bitgood, S. and K. Richardson, 1987. Wayfinding at the Birmingham Zoo. Visitor Behavior, 1, 4.

Visitors are only about 60 percent accurate in retracing their path through a zoo, and tend to overestimate the duration of time they spend at the zoo.

Bitgood, S., R. England, D. Lewis, A. Benefield, D. Patterson and A. Landers, n.d. Visual Satiation at the Zoo: Enough is Enough. Jacksonville, AL: Jacksonville State University. Unpublished paper.

Visual satiation of exhibit viewing was investigated in two studies at the Birmingham Zoo. In the first it was found that the viewing time of visitors was directly related to the order of viewing. Viewing times decreased over successive similar exhibits. For example, the first monkey exhibit was viewed longer than the second, and the second longer than the third. The second study involved experimental manipulation of the order of viewing by directing visitor traffic flow in different directions on different days. Again, it was found that viewing time was longer for the initial exhibits than for later ones. These results were interpreted as evidence of visual satiation or the tendency of events to lose their attraction if too many are experienced too rapidly.

Blakely, R. L., 1981. Formulating an Exhibit Philosophy. International Zoo Yearbook, 21. London: Zoological Society of London.

The proper function of a zoo is to interpret animals in relation to their ethological activities or ecological niches. The three basic questions concerning the public and exhibits are: Who are we trying to reach and why? How do we reach them? What do we tell them and why?

Fostering a conservation ethic in those who had no special interest in nature, conservation or the environment and inspiring them to act to help solve the problem of an imperilled environment is the purpose of an interpretive zoo. Well executed exhibits and graphics can help to get this message across. Considerations in achieving them include whether and how to use humor, aesthetics, and questions. Rigid formulas aimed at uniformity undoubtedly are counterproductive

Blanchard, J., February 1982. Anthropomorphism in Beginning Readers. The Reading Teacher, 35.

Discusses anthropomorphism in beginning reading materials and surveys the history and nature of anthropomorphism as a literary technique and psychological process.

Bloom, J., E. Powell III, E. Hicks, M. Munley, 1984. Museums for a New Century: A Report of the Commission on Museums for a New Century. Washington, DC: American Association of Museums.

There are four forces of change in society today that will have significant implications for museums in the future. The first concerns the way decisions are made, hierarchically vs. concensually. The second concerns the evolving sense of society's own pluralism. Institutions dedicated to fostering and preserving particular ethnic heritages will be increasingly important in helping Americans understand their historical experience from different perspectives, assuming that the museum staff represents the society as a while in its ethnic, racial and sexual diversity. Third, there is an upheaval in education. With heavy emphasis on education, schools diversity to encompass changes in society. The fourth concerns the advent of the Information Age. Information management technology affects museums in their choices of the communication medium, placement and interaction of exhibits, technological use in presenting, etc.

There is a revolution of rising expectations in what people want from cultural institutions. For many reasons, museums today are more popular ever. But attendance fails to measure importance. It is in elevating awareness--esthetic, historical, scientific and humanistic--that museums serve human needs, a benefit that cannot be quantified but must be recognized. Human needs that museums can fill include (1) the reverential experience, that is, the universal human need for a personal experience for something higher, purer, more eternal, more authoritative, more extraordinary, than home work and the everyday world. For most visitors a museum is a place of fantasy and peace, to be alone with one's thoughts with objects that are rare or beautiful, that inspire. (2) an associational space--for other people the museum offers an experience that can be shared. Families, couples and friends come together, and they spend more time relating to each other than to the objects on display. (3), the educational function which appeals to those seeking to make sense of their world. Museums offer broader continuing education than do schools. They convey information but they are far more than "three dimensional textbooks." They are a stage on which a production is presented which allows the visitor freedom of movement, thought and timing to interpret the objects in his or her own familiar terms.

Bloomberg, M., 1929. "An Experiment in Museum Instruction," Publications of the American Association of Museums, New Series, #8. Washington, DC: American Association of Museums.

Formal instruction and exploratory behavior with and without preparation for field trips were compared during school tours using post- and followup-testing. Preparation of children for field trips was found to contribute significantly to the impact of the visit.

Blyth, C., 1972. Education Programme at Los Angeles Zoo. International Zoo Yearbook, 11. London: Zoological Society of London.

The aim of the educational program is to awaken or promote interest in and knowledge of the animal kingdom. The program began in 1965 with docent-led school tours averaging 20,000 children per month designed to augment the formal education program of each age group. In addition, three film strips and two guide books have been developed, an information booth is staffed for visitors, and speakers are available to interested groups in the community.

Bodson, L., 1983. Attitudes Toward Animals in Greco-Roman Antiquity. International Journal for the Study of Animal Problems, 4.

Surveys the range of ancient Greek and Roman attitudes toward animals. Discusses the extent to which these two cultures were concerned with the problems related to animal welfare and rights, and how they coped with them.

Boggs, D., 1977. Visitor Learning at Ohio Historical Center. Curator 10, 3.

The purpose of this study was to assess the extent visiting the Ohio Historical Center is a learning experience and to obtain evidence of such learning. One hundred twelve adults were observed unobtrusively and later interviewed between December 1976 and February 1977. The findings for cognitive behavior showed that visitors scored high in the ability to recall or identify isolated facts of history gleaned from exhibits. Visitors also were able to assign meaning to some exhibits on the basis of personal experience with events, facts, persons, artifacts or places. Findings for affective impact included visitor expression of satisfaction, pleasure, zest or enjoyment. The author concluded that learning was combined with leisure and recreation in this setting without requiring human intervention and with very little use of instructional technology.

Boorer, M., 1966. Educational Facilities for School Parties at London Zoo and Whipsnade Park. International Zoo Yearbook, 6. London: Zoological Society of London.

The London Zoo and Whipsnade Park have developed an education program to encourage fuller use of the living material available for the teaching of zoology, biology and general science. Full-time teaching staff, an education center, and 5 specific courses keyed to the English educational system supplemented by two occasional courses, one aimed at trainee teachers, laboratory assistants and other specialized groups, the other at university zoology students. All are formal courses with a set syllabus, requiring multiple visits but covering a complete topic each time so that single visits are valuable. The basic structure is classroom presentation followed by zoo tour, usually requiring completion of question sheets. the latter are continually evaluated and improved.

Borhegyi, S. and I. Hanson, 1964. Chronological Bibliography of Museum Visitor Surveys. Museum News 42 6.

Borhegyi, S., 1964. Some Thoughts on Anthropological Exhibits in Natural History Museums in the United States. Curator, 7, 2. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

Museum designers began seeking ways to modernize their displays at about the same time that advertisers were adapting propaganda techniques to marketing. Among these devices were the use of symbols to motivate people. Thus, cosmetic companies no longer attempted to sell lanolin, but hope; no longer deodorant, but social success; no longer transportation, but prestige; no longer a smoke but sexual success. The solution to the problem of incomprehensible, cluttered, exhibits took the form in this environment of colorful displays and short, attention-attracting displays. Unfortunately, as so often is the case, the solution to one problem itself raises new

problems. For example, a Mayan exhibit limited to magnificent multicolored elaborately decorated ceremonial vessels miseducates by omitting day-to-day pottery and contributions in such fields as engineering, writing, astronomy, economics and agriculture. Similar distortions come about when only one or two aspects of a culture, such as Egyptian mummies and temples, or Greek temples and pottery, are exhibited. Not only are many anthropological displays one-sided, too few are brought up-to-date. American Indians tend to be treated exclusively as they lived in the 19th. century. By refusing to display the incorporation of modern technology into native cultures, museums are misleading visitors about the current state of these cultures around the world. Thus, questions to be considered in developing exhibits might include:

What is to be presented--the entire culture or only one aspect?
What knowledge or biases is the visitor likely to arrive with?
Will it reach visitors of varying educational levels?
Is the collection and space sufficient to provide comprehensive treatment?
If not, is no exhibit better than a partial one?
Or, is it permissible to focus on selected aspects?
If so, do the labels mislead by suggesting the exhibit is comprehensive?
If a museum focuses on a few aspects of a culture, should it concentrate on the same aspect through all its halls?

Borhegyi, S., 1963. Space Problems and Solutions. Museum News, 42, 3. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

Before exhibits and design halls can be arranged, it is necessary to understand spatial requirements of visitors. Exhibit halls and museum lounges should be suitable to relaxation and movement. Space is territorial, personal, or transactional (no man's land). It may be sociofugal (dispersing people like bus stations) or sociopetal (bringing people together like bars). Culture appears to have some impact: on entering an exhibit areas, Americans tend to turn right, Britons left and Japanese tend to go to the center.

Borhegyi, S., 1965. Testing of Audience Reaction to Museum Exhibits. Curator, 8, 1. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

A museum exhibit that may remain in public view for ten years and be seen by a million people often is designed with less care than a lecture to be read to an audience of a few hundred. Although both seek to communicate, the special characteristics of visitors seldom are considered. Museum visitors are self-motivated and, mostly, non-repetitive. The museum educator must first strive to attract a non-captive audience to an exhibit, then to educate by means of well-planned displays. To do this, he must think through his message, eliminate irrelevancies, condense theories, emphasize important concepts, and reserve a "punch line" for the end. But even with careful preparation, he has no assurance that he has gotten the message across. He has no applause, no question period, no final examination to demonstrate effectiveness. Instead, data on visitor reaction should be collected using the best scientific methods possible to answer questions about options such as layout, color variations, artifact density, and crowd flow, control and density. Several principles can already be suggested.

Visitors almost invariably turn to the right when entering an exhibition hall, then follow the wall moving from right to left, reading display labels from left to right. This both disrupts the flow in a crowded exhibit area and interrupts the thought processes of the individual. Such behavior should be changed by devices such furniture and an angled deflector exhibit at the entrance to get people moving left to right.

Areas of constant crowd flow should have terse, repetitive, exhibits that can be quickly understood. Areas of natural crowd stoppage should have exhibits requiring time to be absorbed or enjoyed unhurriedly while the visitor waits his turn to move on. Areas of variable flow should give visitors a choice among simple and complex exhibits.

Several principles also can be suggested for planning exhibit sequences:

The museum curator and designer must provide a framework for understanding specific displays. The sequence should be carefully programmed, with a predetermined theme and some method of making it clear to the visitor.

Mood and rhythm should be varied, both through the principles suggested above and by such devices as texture and humor.

Some exhibits should be designed to communicate information, some to arouse curiosity, some to make a topic relevant. The audience needs motivation for the effort of display viewing.

In summary, the designer should not think of one display at a time, but of a sequence, planning displays to supplement one another. The task is closer to that of a motion picture director rather than a still photographer. Unless museums take this approach they will fail in their function to provide mass education and will become simply glorified warehouses.

Borhegyi, S., 1965. Test Your Knowledge. Midwest Museums Quarterly, 25, 4. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

Students in a museum methods class taught in conjunction with related courses in primitive art and technology were given the problem of designing an exhibit incorporating questions that were subtly discriminating. Their solution was to provide visitors with a double matching self-test with columns consisting of the date, use and culture of 14 objects. A prepared answer sheet was made available to enable visitors to check the correctness of their answers.

Borhegyi, S., 1963. Visual Communication in the Science Museum. Curator, 6, 1. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

A science museum is much like a university in its dedication to scholarship and education, and its departmentalization. It is dissimilar in the heterogeneity and goals of its audience. But, visitors can and should be tested to determine how much of the museum's messages they have absorbed. Most interpretation is one-sidedly conceived. The curator dreams up the exhibit, and usually tests it only by talking to another curator. Similarly, the artists and label writers work to the standards of their professions. Thus, museums may become a dialect understandable only to professional colleagues, defeating their purpose. Labels, lighting, tactile exhibits, sound (e.g., adding the sound of rain, croaking frogs and the beat of drums to a tropical forest display), space (formal and informal, warm and cold, public and private, masculine and feminine, centrifigal and centripetal), topics and types of exhibit all can be used to meet audience needs, and should be.

Borun, M., 1977. Exhibit Evaluation: An Introduction. In Program Planning Committee, The Visitor and The Museum, Berkeley, CA: Lowie Museum of Anthropology, University of California.

It may require only brief, informal, evaluations to determine that exhibits are successful, but unsuccessful ones require more sophisticated techniques to pinpoint and correct or avoid mistakes. Museums and their visitors can be studied from many points of view including ethnography, testing response to specific parameters and experiments. Techniques for gathering data include formal interviews, open-ended discussions, written questionnaires, cognitive and affective tests, and unobtrusive observation involving tracking and timing visitors, observational checklists, behavioral rating sheets and video-taping. All are needed in museum research, where so many variables interact and so much remains unknown.

One critical area of need is systematic study of visitor response to controlled variation of exhibit components. Research of this sort would clarify how color, lighting, labelling, placement of objects, number, size and complexity of objects and similar variables contribute to measurable cognitive gains, help us to understand the nature of visitor reactions to visits, to explore the instructional effectiveness of different types of exhibits, to appreciate the dynamics of visual and interactive learning and to incorporate this understanding into exhibit-planning and design. In addition, we need comparative studies of data collected in a range of institutions, to distinguish general principles from the effects of specific museum contexts.

Borun, M., 1975. Museum Effectiveness Study: A Bibliographic Review. Philadelphia: The Franklin Institute.

Presents a review of the literature under 8 headings: 1) awareness of museums--publicity, 2) social role of museums, 3) visitors, 4) orientation, 5) process of visit, 6) special programs and materials, 7) exhibits and 8) visitor response.

Borun, M., nd. Measuring the Immeasurable: A Pilot Study of Museum Effectiveness. Philadelphia, PA: Franklin Institute (unpublished).

Bowd, A., 1982. Understanding of Animal Suffering by Young Children. Humane Education Journal, 4.

Suggests that children learn early that inflicting pain on animals is wrong but that animals do not experience pain as acutely as humans. This allows children to function in a society that condemns cruelty to animals but simultaneously exploits them on a massive scale.

Bowd, A., 1982. Young Children's Beliefs About Animals. The Journal of Psychology, 110.

Suggests that kindergarten children's beliefs about animals are egocentric and subjective, and only beginning to be differentiated from those of human beings.

Bowman, G. W. and R. Mayer, 1976. The Brace System of Interaction Analysis. New York: Bank Street College of Education.

An introduction to the use of Behavior Ratings and Analysis of Communication in Education [BRACE], a method of documenting and analyzing behavior patterns of potential value to evaluating interpretive programs such as docent and tour guide programs.

Boyle, P., 1985. Untapped Opportunities for Research in Zoos and Aquariums. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Boston, MA.

Boyle describes a research program with four major facets: (1) research conducted on a full-time basis in conjunction with the Edgerton Research laboratory, (2) interdepartmental cooperation; (3) sponsorship of research by visiting investigators; and (4) research conducted by graduate students from nearby universities. The goal generally is well-conceived and properly conducted research that will increase basic understanding of the biological world and its fragile habitats, increase our presently tenuous ability to conserve, protect and preserve threatened species and habitats; and through appropriate communication of results develop environmental awareness, concern and responsibility in the general public

B. Brady, 1987. The Cat as a Hunter: Cat Exhibit Renovation at the Cincinnati Zoo. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

The Cincinnati Zoo maintains a diverse collection of cats from a wide array of habitats which allowed renovation and modernization around the theme of the cat as a hunter to be fully developed into a tool for conservation, education, recreation, and research. The exhibit space is divided into a rotunda containing 10 exhibits of smaller cats and a corridor with 9 exhibits for larger cats, and details of the exhibit design are provided. Graphics use the theme to tie the natural history of cats to the human experience. The "meaning of play" graphic relates the play of house cats to the behavior of wild cats; life size graphics of cats pursuing an antelope lead visitors from one area to another and their leaping ability. Cats in human culture are shown by a graphic of Blake's The Tyger and an exhibit of a mummified Egyptian cat. Participatory displays include a cylinder which rotates various cats over various landscapes to illustrate the effects of various camouflage patterns, touch exhibits to promote awareness of the dangers cats face from the fur trade, the role of physiological characteristics of cats, and the food web computer. Evolutionary concepts are taught by displays that include a wall chart and a display of fossil cat skulls. Videotape of five cats hunting is presented in a planted seating area.

Braithwaite, J and V. Braithwaite, 1982. Attitudes Toward Animal Suffering: An Exploratory Study. International Journal for the Study of Animal Problems, 3.

A survey of college students found that attitudes supportive of animal rights and welfare generally exist, but that behavior does not always correspond with such attitudes. Suggests more educational emphasis on the inconsistencies between actions and beliefs.

Brennan, T., 1977. Analysis of Topeka Zoo Visitor Survey and Its Implications to Management. College Station, Texas: Texas A & M (unpublished masters thesis).

Brennan, T., 1977. Typical Zoo Visitor Social Group Behavior. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, San Diego, CA.

Brennan, T., 1976. Visitor Watching: What People do at the Zoo. Brookfield Bison (August-September).

Brereton, A., 1968. Education: A Primary Function of the San Diego Zoo. International Zoo Yearbook, 8. London: Zoological Society of London.

Conservation is the underlying theme of San Diego Zoo's entire education program, from preschool to college and adult. A special program has been developed for handicapped children, with separate sections for each category of handicap and content designed to account for and overcome individual limitations. At a college level, three are offered each semester from a catalog that includes separate vertebrate classes aimed at elementary and secondary teachers, a course in mammalogy and one in ornithology, with future courses planned in herpetology, botany and animal photography. Other aspects of the program consists of zoo-oriented talks to various civic and service groups and an adult animal sketching class, but it is recognized that the zoo has many more educational possibilities than those now operating.

Bressler, D., 1981. The Educational Value of Animal-Visitor Contact. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, New Orleans, LA.

This article argues that "hands on" experience with animals enhances the educational value of zoo visits for visitors by increasing the number of senses involved in learning. Touch may be the most basic sense, and certainly is relevant to much that we commonly teach. for example, touching a snake provides direct experience of its scales, and the way it feels as it moves, but also that being cold-blooded does not mean slimy. But, simple touching should yield more questions than answers so is in itself insufficient. Thus, the experience must be described if it is to become a useful learning experience, and both components must be built into our contact zoos.

Brisby, W., 1979. The Exotic Animal Training and Management Program at Moorpark College. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums, Sacramento, CA.

The EATM program seeks to provide students with a good practical and basic understanding of the time and dedication it takes to care for exotic animals and to give them a foundation from which they can build a career working with animals. The program is based on high demands and strict rules strictly enforced. Those who have graduated from this demanding program are employed as veterinary technicians, in zoos, animal parks, research facilities, circuses, and television; some have gone on to more advanced degrees.

Brisby, W., 1985. The Training of A Good Keeper. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums, Anchorage, AK.

Areas of knowledge that provide an important foundation for a keeper naturally include such things as taxonomy, behavior, nutrition, and veterinary assistance, but perhaps less obviously include construction, architecture, public relations and economics. A keeper must understand what constitutes the good health of his animal and be able to assist the veterinarian with capture and restraint. Zookeepers are public servants as well as sales people for their facilities and for the zoological profession as a whole. With a basic understanding of the principles of public relations, a keeper is in a position to inform as well as to protect the zoo from "humaniacs" who feel that any caged animal is abused.

The zoological profession has come a long way in recent years, but no zoo is better than its keepers. Perhaps the day is approaching when people working with wild and exotic animals in all capacities must be certified. Regardless, we hope that all members of the zoological community will continue to see that the keepers employed in their facilities are highly trained professionals with a diverse background of both academic and practical knowledge.

Breuggeman, J., 1982. Zoo Camp: A Summer Day Camp Program. Paper presented at the southern regional meeting of the American Association of Zoological Parks and Aquariums, Montgomery, AL.

The facilities, program structure and staffing of a summer zoo program for 668 children aimed at environmental and zoological education is described.

Brody, J., 1987. The Seasoning of a Docent. Paper presented at the annual meeting of the Association of Zoo and Aquarium Docents, Pasadena, CA. (This paper by a Los Angeles Zoo docent and author of three best sellers is too good to abridge).

As docents we spend considerable time and effort on learning correct terminology--the right word--the apt phrase. We don't want to fill in the blank with "delayed implantation" if the preferred answer is "embryonic diapause." Or hibernation if we're talking about anything larger than a marmot. We go to great pains to get the cloaca and hypsodont teeth and ischial allosities on the correct animals and in the proper places.

This is also true when we speak of the highest primates--ourselves. Over the years we have evolved the correct terminology for docents who have been relatively long in service. I remember early on when that particular breed was called simply "old docents." This has obvious aesthetic drawbacks, and never really caught on. "Mature" docents was run up the flagpole but did not receive many salutes. It conjures up the notion of oxfords and corsets and walking sticks. "Senior" docents had the same failing. "Matriarch" had a rather elegant and scientific ring to it, but by that time our doors had been thrown open to the other sex. In a wicked mood one day Doctor Thomas suggested "fossil docents"...he was sent to his room.

But then finally someone came up with the word "seasoned." And like the baby bear's bed, it was just right. It implied not only quantity of time but quality as well. We have more than two dozen docents who've been seasoning here for twenty years or more. And an additional sixty-some who've--to continue the metaphor--marinated for at least a decade.

The question arises; why are we still here after all this time? It isn't the fine salary, certainly, or the fringe benefits or the comfortable working conditions. Touring great gaggles of children in ninety degree heat or in the threat of pouring rain is hardly what you could call fun. And as we all know, there are those days when the most stimulating questions have to do with the location of the bathrooms and the depth of the hippo pool.

The answer to the question varies with individuals, but it seems generally to do with the great and lasting satisfaction of learning and knowing a subject well, and having the opportunity to pass that knowledge along. docent is from the Latin and means...they teach.

My own experience is, of course, the one I know best. I came to the zoo because it distressed my friend and neighbor that I did no "good works." She was a very community-minded woman who believed that if you were not gainfully employed and your children had reached school age, you owed it to the world to save it in some meaningful way. She saw something self indulgent and even a little sinful about the way I lived. I played tennis every morning and wrote the Great American Novel in the afternoons. When I finished the Great American Novel and couldn't sell it she was even more convinced I was frittering away my time. She had decided to apply for the Docent Training program and suggested it was something i might like because it dealt with animals. She further suggested that since the commitment was for only one day a week, I could go on with my tennis playing and what she called my "creative writing." And I could be doing something useful at the same time.

I was accepted as a provisional in the class of 1968 and I fell under a spell that has never lifted.

My classmates were an odd bunch of ducks--and I knew instantly that I was one of them. We didn't talk about our husbands or children or clothes or recipes. We had solemn discussions about how the canon bone was a fusion of the second and third metapodials. We engaged in great passionate arguments about whether or not the rhino horn was composed of aglutinized hair. Did the baby echidna lap or suckle its mother's milk? And whatever could be the purpose of a forked penis? We scoured the zoo in search of horizontal pupils...and diastamas..and prehensile tails...and nictating membranes. And we gazed down at our own wonderfully opposable thumbs with awe and new respect.

One day a week was not enough time for this fascinating world of living things and how they worked. It became for me a full time obsession and the Great American Novel was put away in a file drawer. I gave up tennis and gained ten pounds. I like to think this was due to the expansion of my cerebral cortex. I went back to school as a biology major and in one class wrote a paper on the four-chambered ruminating stomach. My professor suggested I adapt it for children which I did, and sold it to Ranger Rick magazine.

Then it occurred to me that it didn't have to be an "either/or" situation; that I could use what I was learning about animals and the natural world in fiction. (And praise the Lord I wouldn't have to take calculus).

In my first novel a pair of gaur provided a mystical plot-turn. I learn much about gaur and artificial insemination than I could possibly use. In A Coven of Women, there are marmosets and whales and sloths and a white crowned sparrow that had to be had-raised. The most fun though was the research on copulation as it occurs in sloths. That's the big sex scene in the book.

In The Trackers, recently completed, the research concerned the California Mountain Lion--one chapter is told from the lion's point of view and takes him from birth to his prime. All through, I've had the benefit of

our excellent GLAZA library--and access to the agile minds of a lot of generous people.

So to return to terminology; I, for one, am not still here for altruistic reasons, but, I think, for symbiotic ones--mutual gain. it has probably been a little one-side. All I brought with me was a love for animals, a desire to learn and a willingness to work. What I received in return was an invaluable continuing education in--and appreciation for--the ways of the world and its animals--especially my own kind.

Brodey, P., 1981. The LINKS-Zoo: A Recreational Educational Facility for the Future. International Zoo Yearbook, 21. London: Zoological Society of London.

LINKS-ZOO is a departure from traditional education because it crosses subject boundaries and views the human species objectively along with other forms of animal life. It is is envisaged as a recreational and educational facility located within the grounds of a zoological garden. Its main purpose would be to convey the "links" between the human and other animal species, between animals and other living things and between all living things and the non-living world. It would do this through the combination of an outdoor environment, close contact with live animals and a variety of exhibits. A further aim would be tc provide a place of contrast to the often noisy, cluttered and littered environments of modern society. The major areas of the proposed LINKS-ZOO would include biorama, wild habitats, tamed habitats, zoo gym and riding areas.

Brown, R., 1973. Why Children's Zoos? International Zoo Yearbook, 13. London: Zoological Society of London.

The current disfavor with which zoo managers view childrens' zoos is based on traditional themes no longer relevant to the educational goals of modern zoos. The earliest children's zoos were based on nursery rhymes and storybook animals, which in turn are based on once familiar familiar animals when the country was largely rural. Instead, today's urban child is saturated with visions of anthropomorphised animals. No one wants to eliminate fantasy from childhood--but anyone knowing animals only through these fantasies is likely to believe animals are suited only to ridicule.

The advantages of early learning are well established and fascination with animals is almost universal in little children. Large habitat displays are well within the grasp and physical stamina of most ten-year-olds, but children of five and less tire quickly and learn best by using all their senses and by manipulation. Children's zoos can more effectively contribute to a zoo's education and conservation program by making exhibits intimate and immediate for preschool and young children. The two major ways to do so are by animals presented by handlers, and by petting and feeding areas. The former is most effective when the attendants carry or lead animals through the public areas.

The farm theme is effective because it distinguishes the childrens' from the adults' zoo. It can be extended by presenting farms of foreign lands, which can be picturesque and colorful, but the area represented must be one for which many docile animals are available, with Latin America having great potential.

The conflict between a small, intimate childrens' zoo and the need to avoid crowding can be resolved by having more than one childrens' area open on busy days. This also is economical, as it saves manpower costs, particularly

if volunteers or part-timers are used. Further, it encourages variation: a deer park, a party area, a sound tunnel, a playground of insect sculptures, and an area with educational animal rides. The Bronx Zoo developed a guessing game using single senses. "Look" portholes required identification of a hummingbird nest and a hippo tooth. "Smell" required identification of honey and the castor gland from beaver. "Listen" holes had the sound of a rattlesnake and a whale. "Touch" holes contained rabbit fur, antlers and a conch shell under water.

Brown, W., 1979. The Design of the Informal Environment. Gazette 12.

Bruning, D., 1981. The World of Birds at the New York Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

In an attempt to overcome the tendency of visitors to ignore zoo signs, cartoons were used to reduce the amount of text and to attract the visitor. No assessment of the system has been made but staff have the "impression" that it is successful in achieving the intended goal.

Burnett, S., 1985. Discovery Packets for Zoo Field Trips. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Cleveland, OH.

Discovery Packets are designed to help teachers utilize the zoo facilities and staff to the fullest possible extent. The four main goals of the material are (1) to make educators and administrators aware of the educational resources available at the Toledo Zoo in the form of personnel and materials; (2) to ensure development of observational skills; (3) to help teachers structure field trips; and (4) to convince teachers of the importance of preparation, the desirability of visiting between November and March when animals are active and the zoo less crowded, and to help teachers discuss zoo rules with students.

The materials include a pre-activity list, a vocabulary list, a media list, a post-activity list, a post-activity list, a zoo map and a list of resources teachers might use.

Burnett, S., 1981. Instructional Resource Programs for Zoo Field Trips. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, New Orleans, LA.

Three innovative books were developed over a two-year period to help students and teachers in grades 1-3 increase learning and enjoyment during field trips to the Toledo Zoo. Each book contained teacher instructions, student text, student worksheets and pre- and post-tests. Four areas of the zoo were covered with two packets for each at at separate skill levels. Careful attention was given to keeping format clear and uncluttered. And, every effort was made to challenge observation and thinking skills of students. Advice to teachers is included on preparation for the zoo visit including equipment needed (e.g., a notebook or clipboard to serve as a mini-desk and a totebag or large paper bag for equipment and lunch), most desirable times of the year to visit, and zoo rules.

Butts, M., 1985. The Public Relations Value of a Zoomobile. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Oklahoma City, OK.

The Kansas City Zoo was offered a "zoomobile," envisioned by the donor as a van to bring people to the zoo for docent led tours. When it was pointed out that this would severely limit the type of programs and number of people reached, the donor agreed to provide a van and the necessary equipment for a more typical zoomobile program. A program was devised to provide a personal hands on interpretive and educational experience to develop appreciation and understanding of the animal kingdom, and on promoting the zoo and its recreational opportunities. The idea was to encourage people to plan a visit to the zoo, particularly those in the 18 towns within about 100 miles where the donor franchised restaurants. In the city and immediate suburbs, the zoomobile concentrates on groups and organizations serving people who cannot come to the zoo, such as nursing homes, retirement centers, detention facilities and schools for the mentally and physically handicapped. The zoomobile also is available for Friends of the Zoo events, fund raisers, the annual American Royal Parade and the Flower Lawn and Garden Show.

The zoomobile reaches about 200 groups per year and is supported by an Educational Animal Facility which cares for approximately thirty animals currently available for the zoomobile and other educational programs. Presently there are 33 docents involved in the program. Programs include such subjects as Endangered Species, Native Animals, Animal Habitats, Predator/Prey Relationships, Animal Adaptations and Defenses, and Mammals, Birds, and Reptiles. Programs are tailored to each audience in terms of depth of material and length of visit.

Cameron, D., 1970. The Numbers Game. Canadian Museums' Association Gazette, 4.

Cameron, D. and D. Abbey, 1960. Investigating a Museum's Audience. The Museologist, 77.

Cameron, D. and D. Abbey, 1961. Museum Audience Research. Museum News, 40, 2.

Museum audiences have been studied for well over thirty years but the knowledge accumulated is slight. Possible reasons that a profession peopled with scholars lags behind commerce and industry in employing the knowledge of the social sciences include (1) studies carried out without the assistance of qualified social scientists and without adequate funds, (2) few museums have staff and money to spare on such studies, (3) "audience research" sounds too much like Madison Avenue to attract scholars, (4) failure of many institutions to publish designs and results of studies.

In common with other types of social surveys, the museum audience survey is concerned with demographic characteristics, the social environment and the activities, opinions and attitudes of a definable group of people. Its purpose may be descriptive or it may test hypotheses or assess the influence of specific factors.

Some studies are unique to an institution. These often seek to identify the characteristics of visitors, the effects of public relations and publicity campaigns, the interests of visitors, and the impact of specific exhibits all of which can be useful tools in planning the museum program.

Other studies investigate more general problems. Generalizable knowledge would be valuable about the effectiveness of special devices such as radio tour systems, rear projection screens or interactive exhibits. The problems in measuring the effectiveness of communication techniques in museums are many, and the studies are few. Criteria for such studies may include retention (facts), comprehension (ideas), organization (relationships of facts), incorporation (assimilation of facts and ideas) and communication (ability to pass the message on to others). Such studies require testing large constant groups, such as school classes, and pre- and post-testing. Another important question is the long-term impact of museums on frequent visitors.

Cameron, L., 1983. The Effects of Two Instructional Treatments on Eighth-Grade Students Attitudes Toward Animal Life. Lafayette: Purdue University (unpublished doctoral dissertation).

Investigates ways of influencing eight-grade student attitudes toward animals. One group, consisting of two classrooms, received print material and media-based instruction on animal issues. A second group received print material and lectures on the same issues. A third group served as a control. Results indicated that the media-based instruction group showed the greatest improvement in attitudes, while the control group showed no positive change at all.

Campbell, D. 1973. The Social Scientist as Methodological Servant of the Experimenting Society. Policy Studies Journal, 2.

Campbell's clarification of the limitations of experimental research methods, arguing that the complexity of social settings and the large number of interactions make generalizations from research highly limited and not

useful to the social planner. Experimental research is helpful in saying what has been done but not useful in proposing what is to be done.

Campbell, J. 1985. The Way of the Animal Powers, Volume I: Historical Atlas of World Mythology. New York: American Museum of Natural History.

Campbell, S., 1984. A New Zoo? Zoonooz, 55, 9.

Carr, M., 1984. The Making of An Outreach Program. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Milwaukee, WI

A 24 minute, 252 slide and audio presentation was developed to market the zoo to senior citizens, but has been extended to singles, church groups, civic clubs and other groups. The presentation took six months to develop, required about 1500 volunteer hours and cost approximately $2400 including twin projectors, disolve unit, tape player and two speakers. Precautions include clear marking all components to facilitate proper assembly by volunteers, plastic slide mountings, duplicate slides. It has been in use for three years and shown over 200 times, and a second program, Behind the Scenes Through the Zookeepers' Eyes," is under development.

Cave, J. and R. Wolf, 1983. Don't Brush your Teeth Anymore: Toothpaste's got Earth in It!: A Study of the Role that Objects Can Play in the Experience of Visitors to a Museum. Office of Museum Programs Evaluation Studies.

This study was conducted at the National Museum of Natural History Smithsonian Institution. Its purpose was to measure the effectiveness of exhibits at the Smithsonian Institution. The population consisted of over 200 people who were unobtrusively observed. Eighty people of that population were interviewed because their behavior had been observed and recorded in detail. Otherwise, the remaining visitors were observed as to how long they spent at the exhibit and what reactions the exhibit elicited.

A stratified random sample of 200 visitors to the "Fossils as Natural Resources" and "Deep Sea Dives to Biological Frontiers" exhibits at the Smithsonian based on age, sex and race were observed unobtrusively. Eighty of the 200 who had been observed in detail were interviewed. Data on the remaining 120 consisted of time spent at exhibits and reactions to it.

The combination of familiar and unfamiliar content and the prior knowledge visitors had of the subject of Fossils as Natural Resources made it a fascinating exhibit for most visitors. Most visitors recognized the connection of the exhibit to our everyday lives, most were aware of the relation to other aspects of the Dinosaur Hall in which it was located, but few realized that natural resources often contain fossils.

Reaction to the Deep Sea Dives to Biological Frontiers was positively correlated with degree of scientific background. Many passed it without stopping and few understood the relationship of the exhibit to the remainder of the Seulife Hall.

Chambers, P., 1982. Four Season Demographic Survey, 1981-1982. Philadelphia: Zoological Society of Philadelphia (Unpublished).

Chaplin, R., 1975. The Wildlife Education and Conservation Programme at Edinburgh Zoo. International Zoo Yearbook, 15. London: Zoological Society of London.

The Edinburgh Zoo established an education unit in 1971 to develop the educational potential of the zoo and to provide a national wildlife education service for Scotland complementing the work of related organizations. Direct instruction normally is given in the education center and usually occupies 45 minutes of the basic hour teaching unit and consists of talks, demonstrations and films. Content relates either to the zoo itself or to conservation in general. Basic programs are supplemented with more complex projects developed in cooperation with other organizations, such as the Royal Scottish Museum of the Scottish Society for the prevention of Cruelty to animals. The first full year of operation saw a 31% increase to almost 100,000 in the number of students visiting the zoo, against a fall of 18% in other organized group visitors. Of these, about 12,500 received direct instruction and a similar number followed visit plans developed by the education unit.

Chase, R., 1975. Museums as Learning Environments. Museum News 5.

Cheek, N., 1973. People at the Zoo. Animal Kingdom, 76.

A representative sample of 1,251 US adults were interviewed in their homes. Forty-three percent had been to a zoo in the last two years. Of those who had been to a zoo, approximately one-third had been only once during the two-year period; another third had made 2-3 visits, one-sixth had made 4-5 visits and 7.4% averaged more than 6 or more visits. Most visitors are adults and are more likely to have children than non-visitors. Zoo visitors also had better educations and higher incomes, and were younger than non-visitors. Non-whites were under-represented among visitors. Ninety-six percent went with other people, usually relatives, friends or neighbors, and they seldom interacted with other visitor groups. Forty-two percent said that zoogoing gave them a chance to know their children better.

Cheek, N., 1971. On the Sociology of Leisure Places: The Zoological Park. Paper presented at the annual meeting of the American Sociological Association, Denver, CO.

Cheek, N. and T. Brennan, 1976. Some Social-Psychological Aspects of Going to the Zoo: Implications for Educational Programming. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums,

Homo sapiens, the single species most prevalent in zoos, is the least studied. It appears that the typical visit to the zoo is comprised of three distinct stages. The first consists of initial impressions, during which visitors seem most to notice textures, scale, configuration, distances and features familiar outside zoos. The second, sustaining impressions, comprises primarily clothing and behavior of visitors and the antics and physical condition of the animals and the conditions under which they are kept. Also during this stage, the experience takes on meaning through intragroup behavior such as sign reading or eating. The third stage, terminating impressions, is dominated by evaluative comments on the experience and by fatigue, and is devoid of references to exhibits.

One implication of this concept of how the zoo visit proceeds is a need to attend to how the human behavioral process can facilitate the learning

process. Perhaps one can increase the frequency of visits by broadening the environment for interpersonal contact. For example, we might experiment with more, and more types of of seating areas. Strategically placed eating areas can alter patterns of movement and promote social interaction.

A second implication is the need to give zoo visitors assistance on how to look at the exhibits. This can be aided by clearer and more diverse themes, based not just on geography and taxonomy, but on behavioral similarities, seasonal variabilities, an "animal of the month" and other ideas. In some sense it does not matter which themes are developed. What is important is that some easily comprehended orientation scheme be presented to visitors as they enter.

Churchman, D., R. Carvajal, C. Eames, J. King, M. Noto, K. Wright and S. Bostock, 1986. Animals, Culture and Zoo Education: Report of the IZE Multicultural Education Committee. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA.

The Multicultural Education Committee was created at the Edinburgh meeting of the International Association of Zoo Educators to explore the educational potential of the important and varied roles animals had and do have in different cultures. Since that meeting the committee has catalogued approximately 1000 examples of animals as food, clothing, pets, heroes, mascots, trademarks and symbols. Their role in providing traction and carriage, in war, heraldry and as research subjects, are illustrated. There are curiosities, and two or three instances of individual animals credited with significant impact on human history. Collectively the examples demonstrate that animals have played and continue to play a remarkably large and diverse but increasingly easily overlooked part in human culture. Possible uses of the examples for education and deficiencies in them that should be addressed before the next meeting of the association are discussed.

Churchman, D., 1985. The Educational Impact of Zoos and Museums: A Preliminary Review of the Literature. Paper presented at the annual meeting of the American Psychological Association. Los Angeles, CA. ERIC No. SE 045 883.

Synthesizes over 50 papers on museums and zoos as educational institutions under audiences (staff, volunteers, community, school and recreational), the educational components of zoos (animals, plants, animal enclosures, enclosure groupings, signs, book collections), factors affecting educational impact (visitor demographics, visitor styles, movement patterns, use of time and social nature of visits), the need for research on educational impact of zoos, and common research methods (experiment, sirgle case designs, surveys, evaluations, and nonreactive measures).

Churchman, D., 1984. Issues Regarding Nonformal Evaluation of Nonformal Education in Zoos. Paper presented at meeting of the International Association of Zoo Educators, Edinburgh, Scotland. ERIC No. 250 127,

Because practical and technical problems of tests, interviews, questionnaires and similar interventionist strategies limit reliability and validity of data collected on zoo visitors, the potential of non-reactive methods should be explored. To begin to adapt these methods to zoo research, and to provide graduate students with research experience, student teams conducted six different research projects using nonreactive methods to

investigate selected behavior of recreational visitors to the Los Angeles Zoo. Among these were studies of visitor routes, determinants of holding power of exhibits, attitudes toward animals, sign-reading, and grandchildren-grandparent interaction. These studies contributed to knowledge of the educational impact of zoos and to the development of nonreactive research methods, improved student research abilities while requiring them to work under conditions faced by contract researchers, provided future students with a more advanced starting point for further research and contributed to zoo-university cooperation.

Churchman, D, 1985. How and What Recreational Visitors Learn at Zoos. Paper presented at the annual meeting of the American Association of Zoological Park and Aquarium Administrators (West), Anchorage, Alaska. ERIC No. SE 045 882.

Nonreactive research methods may provide a means for filling some of the gaps in our knowledge of the educational impact of zoos on recreational visitors. To test this concept, six teams of three graduate students each were limited to such methods and given ten weeks to design, propose, carry out and report on certain aspects of human behavior at the Los Angeles Zoo.

Two studies addressed general patterns of visitor movement through the zoo; one addressed sign reading, two addressed affective learning and one addressed interactions among individuals within visitor groups. Results contributed to understanding of the educational impact of zoos and to improving such studies in future.

Churchman, D., January 1978. Selecting Educational Goals: Is Everybody Happy. Educational Technology, 18, 1.

A method is explained for determining opinions of relevant audiences of a comprehensive set of possible educational objectives and combining this information with data on current student knowledge or performance to make a final decision as to the most important objectives for an educational program to address.

Churchman, D., 1987. Visitor Behavior at Melbourne Zoo. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

The potential educational impact of Melbourne Zoo for recreational visitors was assessed using time as the major dependent variable. First, traffic density throughout the zoo was established to provide a broad picture of visitor use of the facility. Second, 18 randomly selected groups of visitors were followed for their entire visit to determine their route, how long they spent in the zoo, and how they divided it among the exhibits, shopping, eating, and other activities. Third, over 5000 groups of visitors were observed to assess predetermined behavior at 18 specific exhibits. Fourth, 550 questionnaires were completed to assess visitor feelings about 11 selected exhibits. Taken together, the measures provide a general picture of the recreational zoo visitor in Melbourne, and the basis for comparisons with identical data from other zoos which may lead to even more general conclusions.

Clarke, G., 1969. Museum of Human Stupidity--A Psychological Deterrent to Vandalism in the Zoo. International Zoo Yearbook, 9. London: Zoological Society of London.

To prevent vandalism resulting in injury or death to zoo animals, an exhibit entitled "Museum of Human Stupidity" was installed that showed actual objects removed from animal enclosures, with a sign telling how these objects could harm zoo animals.

Clarke, G., 1966. Topeka's Joint Educational Scheme with the Public Library. International Zoo Yearbook, 6. London: Zoological Society of London.

Two of the most valuable educational resources in a community are the zoo and library. If they can combine their efforts, it will benefit the zoo visitor, library patron and the cultural life of the community. Zoo brochures, maps and literature are distributed at the library. Staff members of both institutions prepare annotated, selected reading lists available in the library available in schools, the zoo and the library. The library frequently features zoo exhibits, and live baby animals from the zoo have been taken to the library for preschool story hours. Circulation of library books related to animals has increased significantly.

Clarke, G. and R. Miles, 1980. The Natural History Museum and the Public. Biologist, 27, 2.

The British Museum's exhibit of "Man's place in evolution" is divided into five major sections. The first two deal with man's relationship to modern animals and show that he is a mammal, a primate, and an ape. The third section asks whether any closer relatives exist in the fossil record, the fourth looks at tool-making and fire and ceremonies among three fossil groups and finally deals with modern man.

The design emerged from a thoughtful consideration of the many audiences that the museum serves (e.g., the interest of the general public in a small collection of interesting objects vs. the scientist's need for the most complete possible collection of a single species), of the elements that make an exhibit interesting, enjoyable and informative, of the Museum's intention to change the perception that it is principally a children's museum, and practical considerations such as the brief attention likely to be given a single exhibit.

Three reasons for going beyond simple presentation are noted: the nature of science (the ideas of modern biology are abstract and complex), of human memory (which is aided by a context into which facts may be assimilated) and of perception (which moves from the concrete to the abstract). These factors can be guided by architectural characteristics of the exhibit.

Clark, K., n.d. Animals and Men. London: Thames and Hudson. New York: William Morrow

Clowes, M. and L. Wolff, 1980. A Preliminary Evaluation of the "Birds in Canada" Exhibit. National Museum of Natural Sciences. Ottawa, Canada. ERIC No ED 198 043.

This study of the Birds in Canada exhibit examines the effectiveness of the traditional and modern displays and the use of visitors' identification labels, text, map and film. Over 7000 museum visitors comprised the random

sample. Evaluation methods included observation, interviews, and cognitive testing with the use of pre- and posttests. Results indicate that while traditional and modern displays are equally effective, neither type increases visitor knowledge of the subject matter. The displays have a poor attention holding power and the incidence of visitors reading the text and map is low. Less than 5% of all visitors stop at the introductory text and map. A large segment of the sample were unable to identify specimens or had difficulty doing so. Finally, although the accompanying film is effective, only 32% of the visitors viewed it. Recommendations are to redesign and rewrite the information and to evaluate it before it becomes a part of the permanent display. Information panels should be moved to a place where visitors stop more frequently. The authors provide samples of tests, interview and testing results, and a description of data collection methods.

The results of this study reveal areas in which improvement is needed: 1) While traditional and modern dioramas are in general equally effective, neither type is increasing the visitors' knowledge of the subject matter presented in the exhibit. The traditional dioramas attract 37%, while 34% stop at the modern display. This 3% difference is not significant. They do not differ in the ability to hold visitors. The average viewing time of most displays are not long enough to allow for transfer of information to occur. The second difference is not statistically significant. The poor holding power of the exhibits, and the low incidence of sign reading explains the low educational effect. The information should be re-written to make it more appealing to read. Evaluation studies should be done to ensure optimal effectiveness before permanent installation 2) Another serious problem was found regarding the introductory text and map. Less than 5% stop at the two panels, and those who do, spend less than ten seconds reading or absorbing the information. When interviewed, the visitors said that they had not stayed at the text or map because they did not find them attractive enough, or because they had not seen them until the end of the visit. Since these panels explain the main theme of the exhibit, and provide a framework in which displays are to be viewed, careful study should be devoted to this area. One possible solution is more panels in the main hall of the exhibit where visitors tend to stop more frequently or to accompany the information with specimens since visitors are attracted to a display and will read it because of the specimens. 3) A third problem was discovered concerning the identification labels. Most visitors are able to identify the specimen by using identifications labels. However, 22% are not able to use them at all, and 13% have difficulty trying to do so. This 35% of all visitors who experience difficulty should not be ignored. It is a large enough segment of the visiting population to indicate that redesign and further testing are needed in the Birds of Canada exhibit.

Coe, J., et. al., 1982. Bringing it All Together: Integration of Context, Content, and Message in Zoo Exhibit Design. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Phoenix, Az.

Much of our response to what we see in a zoo is modified by the context (e.g., the people, public areas and animals themselves) in which we find ourselves. The context can and frequently does nullify the efforts of zoo educators and interpretive planners, so must be taken into account in designing exhibits.

Coe, J., 1985. Design and Perception: Making the Zoo Experience Real. Zoo Biology.

The purpose of this paper is to encourage the application of theories of human behavior to zoo design so that zoo visitors are predisposed to learn from and enjoy what they experience. The ultimate goal is to increase public awareness and appreciation of the importance of habitat and its protection to wildlife conservation and to present zoo animals in such a way that their reason for being and rights to existence are self-evident. Concepts, many suitable for research that would assist designers and others in continued improvement of the zoo visitor's experience, are presented:

Zoo visitors spend a surprising short time actually viewing exhibits, but this time may be increased by applying the principle that objects and experiences are observed in approximate proportion to their novelty, provided they bear sufficient relation to our experience.

The zoo experience can be made more memorable if it involves anticipation, lack of distraction, novelty, fulfilled expectation, emotional involvement and reinforcement through retelling.

First experiences affect our interpretation of later experience even if the later information refutes the earlier.

Humans will be more disposed to learn from animals if they are looking up at the animal, encounter it by surprise, are in a novel or unfamiliar setting (e.g., nocturnal), are surrounded or outnumbered by animals, and are close to the animals. This in turn suggests multiple viewing exhibits such as those at the Basel Zoo and Arizona-Sonora Desert Museum.

The zoo experience should be enjoyable, but this does not mean that mild anxiety should be avoided. Many popular activities involve varying degrees of risk, and viewers enjoy subjective thrills and danger. Anxiety improves experiential learning. Other ways to give pleasure include care giving, aesthetic appreciation, discovery, novelty, complexity, ambiguity, uncertainty and communication. But, traditional exhibits lack mystery and drama, are sterile and predictable.

Coe, J., 1986. Towards a Coevolution of Zoos, Aquariums, and Natural History Museums. Paper presented at the annual meeting of the American Association of Zoological parks and Aquariums, Minneapolis, MN.

Zoo, aquarium and natural history museums have moved, or are moving, through seven major phases. First, royal collections, with animals caged in Baroque symmetry. Second, public collections, organized on the basis of whimsy and entertainment, and including bear shows and the like. Third, from the mid-18th century and reflecting the philosophies, taxonomically organized exhibits in a race to see who could identify and name the most species, but continuing the tradition of collecting the oddest, rarest or most dramatic specimens. Fourth, habitat exhibits, beginning with Bullock in 1809 and led by the British Museum and American Natural History Museum. In zoos, Hagenbeck's moated exhibits became the model. Fifth, influenced by the modernism movement in architecture in the 1930s, exhibits striving for simplification and abstraction through technology, giving us the tile-lined room with glass front and stainless steel furnishings for most large zoo animals. Sixth, the move led by Woodland Park and Arizona Sonora Desert Museum toward duplicating natural surroundings and hiding walls and buildings as much as possible. Seventh, high tech exhibits using such devices as touch screen computers, laser disk video systems, holograms, robotics.

Coe, J., 1987. What's the Message: Exhibit Design for Evaluation. Paper presented at the annual northeastern regional meeting of the American Association of Zoological Parks and Aquariums, Syracuse, NY.

People continually receive and sort information from their environment. Common features like broken benches and overflowing trash receptacles communicate staff carelessness. Exhibit features, despite the best intentions, all communicate the concept of a human-dominated universe. Animals are presented in man-made edifices or gardens, to amuse the people who surround them, dependent on keepers to meet their every need. This does not create concern for habitat and species protection.

To overcome this message, exhibits should simulate walks through natural environments, on narrow paths with no visible containment of the animals. Effectiveness would be measured by visitor pulse rates! Every element in the zoo or aquarium from benches to beverage containers should be revised so that its implicit message resonates the overall message. The areas that our educators usually address--interpretation and explication--are merely second order messages to the more important affective one.

Cohen, M., 1973. Facility Use and Visitor Needs in the National Museum of History and Technology." Office of Museum Programs, Smithsonian Institution (mimeograph).

Pre-visit interviews and post-visit questionnaires were used to assess effects of distance walked, fatigue and group size on visit are assessed.

Collins, M., November 1976. Student Attitudes Toward Animals. American Biology Teacher, 38.

Describes a study which attempted to determine differences between boys and girls animal preferences, and differences between biology majors and nonbiology majors preferences. Also attempted to determine differences in preferences for particular groups of animals. Results suggest boys like a wider range of animals than girls and like individual animals better than girls. Also, mammals were preferred to all other groups and carnivores were less well liked than herbivores. Attitudes were more positive among biology than non-biology majors.

Cone, C., and K. Kendall, 1978. Space, Time and Family Interaction: Visitor Behavior at the Science Museum of Minnesota. Curator, 21, 3.

Twenty-six family groups (86 people) visiting a museum Anthropology Hall consisting of 43 exhibits in five areas were observed and interviewed to determine movement and interaction patterns. Average time spent in the hall was 10 minutes; almost no family attended to all exhibits; average time spent at an exhibit was 30 seconds. Amount of time spent at exhibits correlated highly with exhibits recalled during the interview and with amount of verbal interaction generated by exhibits. Dioramas and the Egyptian mummy received the most attention, graphic displays the least. Movement through the hall did not correspond to the logical sequence planned by museum designers, but focused on the four large and dramatic exhibits. Movement was similar among all groups through the first two areas then began to diverge, becoming almost random in the last area. As people progressed through the hall not only did their movement pattern vary more, but so did the number of exhibits viewed, the time spent at each exhibit and the amount of verbal interaction.

Within 18 two-parent groups, mothers spoke with children 30, and fathers, 11 times. Boys were more likely than girls to initiate verbal interaction or movement.

Conway, W., 1968. How to Exhibit a Bullfrog: A Bed-time Story for Zoo Men. Curator, 2, 4. Reprinted in N. Duplaix-Hall (ed), 1973. London: International Zoo Yearbook, 13.

Conway tells of a dream which begins when a devil remonstrates with him for buying a pygmy chimpanzee when he doesn't have a proper exhibit of bullfrogs. Conway replies that bullfrogs will not do much in the way of education or recreation or to excite the public. The devil replies that the bullfrog has unlimited possibilities along these lines. That zoo people put one or two bullfrogs in a half-full aquarium, put up a badly worded label and consider the exhibit complete. Conway is then taken through an ideal exhibit.

The exhibit is behind a gate that is programmed for an optimum number of visitors, but avoids the regimentation of a conveyor to reach different levels of interest, age and education by allowing people to move at their own pace. It recreates the world of wild creatures and minimizes that of man.

The first hall portrays the biosphere of the bullfrog, and included blue herons that hunt the frogs, nesting birds, orb web spiders, underwater viewing of fish, etc., facilitated in some cases by binoculars trained on key points. Exhibits were confined to one side of the hall so there was no need to backtrack to see the displays in a logical fashion. Some had two levels of labels, the higher ones slanted so children couldn't see them, encouraging parents to explain the exhibit and promoting interaction while enhancing the parent's image in the child's eyes.

The second hall dealt with the evolution of the frog, and a film depicting the ecology and life history of a wild bullfrog from egg to death, through growth and development and through the seasons.

The third hall began with four habitat displays,each representing an identical portion of the pond in the four seasons. Floors changed in texture and angle, halls in width, to guide the visitor subtly to the best viewing locations.

The fourth hall was "A Spring Night at Bullfrog Pond, carpeted to keep down visitor noise, equipped with beam lights on swivels to help people find animals, with artificial firefly flashes and a recording of a barred owl to give depth, distance and sound to the exhibit.

The fifth hall was devoted to reproduction, growth and development including exhibits on the function of frog calls, territoriality, displays of males and females, sexual dimorphism, social and agonistic behavior and population dynamics. The sixth hall dealt with food and enemies, including what and how much frogs eat and what eats them at various stages of their development. A film which visitors could slow down or see at normal speed showed a frog catching a fly. A pinball machine was arranged to allow children to explore the hazards of a frog's life. Another display dealt with diseases and parasites. A restaurant with tables arranged on a terrace overlooked a 30 foot slough, with a planetarium-type ceiling to simulate late evening, and recordings mixing music and frog choruses.

Other displays dealt with the bullfrog's economic importance, its relationship to man, its place in art, music, folklore and research. A map of the US was lit to show the extent of wetlands and bullfrog range at various times in the past and today.

Conway's devil argues that there is no excuse for acquiring more animals than can meaningfully be exhibited, that zoos should show fewer animals well

rather than many poorly, that a poor display can destroy the wonder of the rarest and most marvelous creatures. Our urban populations have expanded so rapidly that whole generations are growing up without any natural contact with wild creatures. Yet the votes of these urban residents will determine the fate of our wild places. they must be given an intellectual reference point, meaningful and aesthetically compelling, a feeling of personal interest in diminishing wild creatures and of collective responsibility for their future.

Cotter, E., 1987. Guided Tours: What's the Message. Paper presented at the annual meeting of the Association of Zoo and Aquarium Docents, Pasadena, CA.

In planning the 1987 docent training classes at Walter D. Stone Memorial Zoo, questions were raised about needs of docents and priority given topics to be included in ten four-hour classes. This led to an evaluation that focused initially on the guided tours given by docents. A sample of six guides (one-third the total weekday volunteer staff) and four classes including a bilingual third grade, a special needs class, a public school second grade and a private school second grade were randomly selected.

Naturalistic observations provided information about the internal dynamics of the setting, the activities, the participants and the meanings of the experience to them. Open-anded questionnaires completed by zoo guides identified such information as why docents continue to serve, topics of interest to their audiences, and useful methods for conveying information to young children. Teacher evaluation forms provided information such as the usefulness of pre-visit packets, what topics were covered and their appropriateness, and the attitudes of the guides to the group.

The evaluation data identified three topics included in training that were seldom addressed on tours (habitats, endangered species, and animal behavior). Further investigation determined the difficulties encountered by guides in addressing these topics (e.g., non-natural exhibits are not conducive to discussing habitat; concepts about endangered species too difficulty for young children; docent knowledge of animal behavior) and to relatively simple and direct changes (e.g., reducing the number of non-natural exhibits visited; inclusion of vocabulary related to endangerment in pre-visit materials; inclusion of a videotape on animal behavior in docent training) to improve the situation. Content analysis of the types of questions asked by children identified three additional themes for inclusion in docent training: care of the animals, physical aspects of exhibits and how things worked, and animal, keeper, and their own safety.

Evaluation proved an important component in maintaining a viable and effective docent training program. The recommendations cited illustrate how simple changes in training classes may more effectively prepare docents to deliver their message.

Cottle, T., 1973. The Life Study: On Mutual Recognition and Subjective Inquiry. Urban Life and Culture, 2, 2.

The author explores his feelings regarding the use of structured interviews to obtain information from families, primarily those from lower economic levels. While recognizing the importance of objectivity, he faults the depersonalized approach by which it is achieved as preventing respondents from expressing feelings of great potential interest to researchers. He also faults the tendency of researchers to overgeneralize from small numbers of such interviews.

Crandall, L., 1964. Management of Wild Animals in Captivity. Chicago: University of Chicago Press.

Crandall cites the importance of wild animal exhibits and their universal appeal as indicated by the increase in Zoological Parks in many countries. The prime factors in the role of the zoo is not just the showing of the animals, but also the conservation of the animals.

Exhibition areas, indoors or out, must meet the basic requirements of the animals, prevent escape and provide for viewing. The goals of zoos are changing as world conditions change. Increased emphasis is being given to instructing the public on the need for conservation and for preservation of endangered species and the habitats on which they depend.

Crandall sees the zoo as a place of learning as well as pleasure. He believes that making zoo exhibits as much like the natural habitats of the animals they display is fundamental to the educational responsibility of zoos. Breeding is vital to preservation of species. Utilizing zoo networking helps each facility remain aware of which species are becoming or are endangered.

Cronbach, L., 1975. Beyond the Two Disciplines of Scientific Psychology. American Psychologist, 30, 1975.

The object of experimental method is to produce general laws which explain human behavior. Cronbach discusses factors which prohibit achievement of this objective, including the complexity of interactive effects, time as a source of interaction and the invalidity of controlled experiments. Alternative methods based on observation in natural settings are discussed.

Dailey, P., 1984. Buffalo's Science Magnet School: Drawing Students to a Zoo's Classroom. Paper presented at the northeastern regional meeting of the American Association of Zoological Parks and Aquariums, Buffalo, NY.

The Buffalo Science Magnet School is intended to draw city students to an alternative educational environment that develops motivation and discipline and encourages learning and personal development. The junior high school is housed permanently on zoo grounds. The zoo staff works with the regular science and English teachers to provide a specialized science program. It involves a practical, hands on learning program that stimulates learning, expands learning resources, provides role models and develops functional skills.

Dallas Zoo, 1985. Basic Keeper Training. Dallas, TX: Author.

The Basic Keeper Training Program is a self-administered one which requires six months to complete and includes tests at the end of each month. Passing the course will be required of all newly hired keepers during their 6-month probationary period. The program also is a prerequisite for those keepers who want to advance their careers.

Darwin, C., 1986. An Evaluation of the Interpretive Elements of the Kopje Exhibit at the San Diego Zoo. Unpublished report.

Tallies, comments, tracking sheets, and questionnaires were used to gather information about attitudes and habits of visitors to the kopje exhibit at the San Diego Zoo. The most successful hands-on component, in terms of numbers using them, were the peepholes (35% of all visitors). In terms of

visitor ratings, the favorites in order were the hot rock, peepholes and klipspringer hair and feet. The most read labels dealt with the hyrax, hot rock, mongoose, and rockclimbers gear. The average number of visitors was 500 per hour and average length of stay was 6.8 minutes. Correlation between length of stay and number of panels read was not high. Correlation between age and label-reading was high positive, and between age and use of hands-on components was high negative. Correlation between educational level and label reading was low. Visitors recognized the kopje as a place of shelter with water and food, but generally were not aware of specialized adaptations of animals to it. They particularly liked an exhibit that was based on a natural environment, and suggested the zoo build more of them.

Das Gupta, C., 1951. On the Use of Museums for Illiterates in India. Journal of Indian Museums, 7.

Dathe, H. and F. Zwirner, 1974. The Education Department at Tierpark Berlin. International Zoo Yearbook, 14. London: Zoological Society of London.

The aims of the program have been not only to integrate the zoo into a framework of natural history instruction but also to bring it within the scope of the student's civic and cultural education. A list of courses, graded according to pupil abilities and ages, is circulated among teachers and educational establishments in the area. The program is based on 7 themes: (1) correlation between climate, mode of life and morphology of vertebrates, (2) physiology and [illegible] of flight in birds (3) domestication as biological experiment, (4) [illegible]vation, (5) the youth club, (6) ethological problems such as communicat[illegible], group and breeding behavior, and (7) plant adaptation.

Dean, J. and W. Whyte, 1969. How Do You Know if the Informant is Telling the Truth? In G. McCall and J. C. Simmons, Issues in Participant Observations: A Text and a Reader. Reading, MA: Addison-Wesley.

The issue of whether or not an informant participating in a study is being truthful is addressed. Researchers cannot ask directly whether an informant has been truthful. Instead, factors such as the informers emotional state, values, attitude and knowledge are factors that can be taken into account in making a judgment. The authors suggest that if the informant has no likely motive to deceive a researcher, data may be accepted as truthful (No advice is provided if this condition is not met).

Denny, C., 1985. The Texas Connection: A Support Network. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Oklahoma City, OK.

Five goals of the network are (1) to maintain a network for the exchange of educational information among zoo and wildlife educators in the state of Texas, to form a central information source for exchange of materials, to file and exchange ideas with Texas educational organizations, to enhance and work within the guidelines of the AAZPA and its Public Education Committee and to exchange ideas and work with the International Zoo Educators. These goals are pursued through twice-yearly meetings, monthly newsletters and an organization consisting of seven committees.

Diamond, J., 1981. The Ethology of Teaching: A Perspective from Observations of Families in Science Centers. Berkeley: University of California (unpublished doctoral dissertation).

Twenty-eight family groups were observed on weekend days for the duration of their visit to either the Lawrence Hall of Science or the Exploratorium, and behaviors categorized post-hoc into 21 groups. Results suggest family members vary in teaching styles and purposes. Parents teach as a way of communicating with children, while children teach as a way of acquiring information themselves. Teaching is a reciprocal activity in which family members exchange different kinds of information. Parents convey symbolic information while children convey information about the operation and appearance of the exhibit.

Donahoe, S., 1986. Developing the Conservation Ethic in Zoo Visitors. Journal of the International Association of Zoo Educators. 15.

Market research at San Diego Wild Animal Park suggests that we can do more to help visitors develop positive attitudes by providing them with (1) a more active experience, (2) planning more activities for children, and (3) providing for change when designing facilities and programs.

Information retention is improved by methods such as asking questions, using familiar expressions (e.g., "one strike and you're out" to describe a rattlesnake bite), quotations, comparisons particularly with common human experiences ("sticking together for the sake of the kids" to describe lifetime pairing in eagles), involving instructions and activities, and parody.

Attitude development is assisted by helping visitors to identify or clarify their attitudes on wildlife issues through devices such as allowing visitors to vote on alternatives (e.g., choose among alternative conservation methods proposed for a particular species).

Taking action is encouraged by inviting conservation groups to have representation at the zoo, providing information visitors can take home, increase visitor interaction with plants and animals, work with local schools to integrate conservation into the curriculum, and above all practice conservation in the zoo (recycling, etc.) and point it out to visitors.

Doyle, E. M., et. al., 1982. Evaluating Programmatic Use of a Community Resource: The Zoo. Journal of Environmental Education. 13, 4.

Dubos, R., 1973. Sensory Perception and the Museum Experience. Museum News. 2.

DuPre, C., 1982. Education on a Shoestring: Tight Budgets Don't Have to Mean Skimpy Programs. Paper presented at the southern regional meeting of the American Association of Zoological Parks and Aquariums, Montgomery, Alabama.

DuPre suggests ways educational curators with small budgets can still be effective. Running a program with little money is hard work and demands creative thinking and perseverance. It requires willingness to develop modest programs, and care to avoid slovenly or inaccurate ones. DuPre recommends "just talking" with keepers, curators, volunteers and teachers, and writing to other zoos, then listing usable ideas as local projects. The process is important too in persuading and managing people and in overcoming resistance to change. Second, the ideas must be prioritized into long and short-range goals. Again, it is important to involve the director and other key people in

this process, to draw on their experience, and to win their commitment. Consider existing resources both at the zoo and in the community which can be drawn upon to minimize new resources needed to develop programs. Personnel resources are particularly valuable and may be worth setting up a data base so that you can locate equipment or skills as needed. Third, develop ways to accomplish priorities, rather than developing every good idea you learn from other zoos. Numerous specific tips are provided for low-cost development of educational workshops for teachers, newsletters and other zoo activities.

Everly, R. 1975. Fun, Fantasy and Function in Children's Zoos. In A. P. G. Michelmore, Proceedings of the First International Symposium on Zoo Design and Construction, Paignton, ENGLAND

In terms of attendance, all zoos are children's zoos, and all children's zoos are adult zoos. But, they have evolved separately, or as a zoo-within-a-zoo, beginning about 1950, for several reasons. First, some communities could not afford a zoo of major proportions. Second, it was more desirable and realistic than the menagerie type of exhibits. Third, some communities built them first as "starter" zoos to develop interest in a full-scale zoo. Fourth, the emphasis on contact and domestic animals has special appeal to children. Fifth, it often is felt that actual contact with animals has great educational and emotional value to children.

The first children's zoo designed by the author's firm was at LaFontaine Park in Montreal so appropriately used Aesop's fables as the basis. This and other projects suggest that attitudes toward children's zoos are changing and need constant reappraisal, and that children's zoos should reflect the basic principles of a major zoo. They should be fiscally sound and be educational and recreational facilities.

Falk, J., 1976. Outdoor Education: A Technique for Assessing Student Behaviors. School Science and Mathematics, 75.

A persistent problem in education has been a convenient and reliable method for assessing behavior. Most methods tried have produced either too little or too much information that is difficult to score in a way useful to project objectives.

The Outdoor Biology Instructional Strategies Project [OBIS] conducted field trials in the fall 1973. Active student participation was a major OBIS goal.

Prior to each activity a 35mm camera was placed on a tripod from which students could be photographed. Pictures were taken every 2 minutes, and the activity intended at the time of each was noted along with the number of the photograph.

Later, each student in each photograph was rated as 1) Involved, 2) Not Involved or 3) Can't tell and a score determined for each photograph using I/(I + NI) [correlation between two judges was .80 or better]. The mean of all scores from a session was taken as a measure of involvement for that group and activity. Involvement was correlated with cognitive gains and found to be high in 3 areas assessed.

This technique provides a manageable, nonreactive and valid system for assessing student involvement in an activity.

Falk, J., 1982. Use of Time as a Measure of Visitor Behavior and Exhibit Effectiveness. Roundtable Reports 7, 4, 10-13.

The duration of a museum visit is related to a variety of factors that we all realize but often forget (parking meters, appointments, bus schedules, lunch hours, hunger, mental fatigue, physical exhaustion...). The allocation of time is a useful barometer of underlying interests, motivations, satisfactions and dislikes. Time is perhaps not coincidentally the single measure most frequently used for evaluating exhibit quality and effectiveness and assessing visitor behavior.

Time spent and other observable non-verbal behaviors predicts educational impact of exhibits. It is related to exhibit preferences. Laetsch (in press) found that the average visitor spends no more than two hours in a museum and that about three-quarters of this time is spent visiting the bathrooms, gift shop or cafeteria. Only about 30 minutes will be spent attending exhibits.

Some visitors see a large number of exhibits in this time, spending very little at each. Others see fewer exhibits, spending longer periods at some of them. That is, at any one exhibit the time spent by visitors is bimodally distributed, and positively skewed, so that the mean does not accurately reflect the behavior of any significant group of visitors. Therefore, modes usually are more appropriate than means as summary statistics of exhibit holding power. A bimodal distribution implies that more than a single population is represented. One procedure is to divide the data at the antimode and to analyze the groups separately.

A possible explanation of the bimodal distribution is drawn from the way shoppers act. A serious shopper goes directly to the department of interest, examines the choices, and completes a purchase, spending a considerable time in a single department but little or none in others. Window shoppers stroll the aisles, stopping very briefly and a large number of departments, and at best are impulse buyers. Analogous behavior by visitors, for whatever reason, probably does not fit the museum staff's ideal for a visit.

This leads to questions: how many museums have made serious efforts to provide proper orientation for visitors? How many museums arrange their halls so that the most important exhibits are nearest the entrance? Would most museums even know which ideas to put on "sale"? Do most museums offer the same information at varying levels of sophistication or do they aim for some middle ground? By thinking in these terms, perhaps museums could be more effective.

Faust, C., and D. Rice, 1978. Zoological Society of San Diego Design Handbook. San Diego: Zoological Society of San Diego (unpublished).

Fazzini, D., 1972. The Museum as a Learning Environment. Milwaukee: University of Wisconsin (unpublished doctoral dissertation).

Ferguson, G., 1954. Signs & Symbols in Christian Art. London: Oxford University Press.

The initial chapter catalogs animal-related signs and symbols.

Finlay, T., D. Woehr, and T. Maple, 1984. Evaluation Techniques in Zoo Environments: Visitor Attitudes and Animal Behavior. Paper presented at the annual meeting of the Southeastern Psychological Association.

Firth, L., 1987. The Life and Timing of Print Materials: A Model System. Poster session presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

A schedule for developing all interpretive and promotional material is established annually, working back from the date program developers want the final material to determine deadlines for each of the steps in the process. These steps include first draft, first ok, final ok, illustration ok, layout, ok camera-ready art, and actual printing. Examples of this process are provided to show the process of identifying information and turning it into materials that meet Monterey Bay Aquarium criteria (Rand, 1986).

Fischer, G., 1987. Fund-raising from the Public Sector through the Use of Volunteers. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Some concrete ideas for a obtaining passage of a tax levy begins with organizing tasks: a calendar of events that pinpoints filing dates, press announcements, registration requirement dates and pre- and post-election reporting requirements. Drafting ballot language and designing an advertising campaign follow.

TV ads are part of your advertising efforts. Brochures and door hangars incorporating the same themes are effective only if they reach your constituents. Target specific areas of your community and assign volunteers to cover them. They must have proper identification, be fully briefed on the issues, and must contact each household in their area by talking to residents or leaving literature.

Rally volunteers around the idea of writing letters to all registered voters--it need not be long and can even be handwritten, but should be personalized. Use your connections--obtain endorsements, contact your local newspapers and political organizations. Create a volunteer speakers bureau to reach community groups. Locate drivers willing to display bumperstickers and

homeowners and businesses willing to display signs supporting your cause, and have volunteers distribute them in time to do some good.

Volunteer pollworkers should be assigned to each precinct in pairs or on overlapping schedules and should be provided with buttons, brochures and whatever else you've developed for last effort.

Fundraising in the public sector is complex: there is a handbook by Brody, Goodman and Joseph titled Tax Levies and Other Ballot Issues: A Campaign Handbook, that may prove useful.

Fisher, G., 1985. The Interrelationship of Zoo Staff and Volunteers at the Cincinnati Zoo. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Cleveland, OH.

The success of volunteer programs is dependent on creating a sense of involvement, recognition, and a sense of responsibility through such devices as newsletters. Case studies of individual volunteers are presented.

Fisher, W., 1987. Image and Consistency in Marketing--How Important is it? Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

"Image"--in the dictionary sense of "a mental conception held in common by members of a group; symbolic of a basic attitude..." should be good and consistent if a marketing plan is to be effective. Thus, it encompasses every area of zoo or aquarium operation and extends to all our constituencies as well, including staff, governing body, volunteers, members, donors, visitors, the media, general public and our profession.

Visitors begin to form an impression with the phone call to find out your hours, or sees you in a magazine, or on a billboard, or learns of you from a friend, all before they reach the front gate. Just how easy you make getting to the institution can set the tone: e.g., is there adequate road signage, assistance for the handicapped, a simple map handed to them at the entrance by a "welcoming" person, a restroom near the entrance?

Once inside, are the first things visitors see negative--e.g., signs warning of fine and imprisonment for feeding animals, a maze of paths accompanied by confusing signage? Not all visitors are literate, at least not in English, and map reading requires reading and conceptual skills many visitors do not have, so it is important to consider where you place people who know how to give simple answers to questions. Have the quality, convenience and appearance of food concessions and souvenir shops been critically evaluated? Are restrooms easy to find, adequate in number, clean, well-maintained, and provided--in both the women's and men's--with facilities for parents to care for infants?

Signs should not obstruct exhibits, but be easy to find, easy to read, educational, interesting, large enough for those with impaired sight, and appropriate for the young. Exhibits must be easy for children to see as well as adults--try viewing them from your knees to get an idea of how often parents must lift small children, or how your fencing obstructs their view--no wonder children get tired and bored. Programs and hand-outs should complement the experience, and of course should have an overall "look" that is consistent with overall image.

This exercise gives some notion of how to review your image from the perspective of the visitor. It should be repeated for all your audiences. It is vital to look at all the things that affect perception of your institution by all your audiences.

Fitzgerald, T., September, 1981. Evaluating Humane Education: The Jefferson County Study. Humane Education.

Analyzes the effects of three different humane education treatments on fifth and sixth grade students in Jefferson County, CO. Treatments varied as follows: (1) reading material with no instruction; (2) reading material with instruction; (3) reading material with instruction repeated over four visit and (4) control receiving no special treatment. Results showed a significar difference in attitudes as a result of the treatments, with treatment numbr two found to be most effective.

Fleming, J., 1967. Educational Programme for Children at Atlanta Zoo. International Zoo Yearbook, 7. London: Zoological Society of London.

The facilities and development of the educational program from 1958, including the use of animals and plants, and relationship with local schools, is described.

Fox-Davies, A. (J. P. Brooke-Little revision), 1985. A Complete Guide to Heraldry. New York(?): Bonanza Books.

Provides a catalog of animals which have been used in European heraldry, and an explanation of the rules and terminology involved.

Freeman, H., 1985. Conservation Education: What's New. Paper presented at the meeting of the American Association of Zoological Parks and Aquariums, Columbus, OH. Reprinted in Journal of the International Association of Zoo Educators, 15

Education programs should be expanded beyond just informing people that there is a wildlife and habitat crisis. Knowledge without action creates anxiety and is ineffectual. Exhibits can be combined with programming, such as the short ecology plays pilot-tested on the main pathways of the Philadelphia Zoo, or the National Zoo's festival that includes mimes, drama and puppets, take visitors beyond the passive signing on which we have become overly dependent. They also boost attendance. There is a growing awareness of the need to group exhibits around a theme, such as Burnet Park's "Wild North" which was laid out to take visitors from least- to most- effected environments and thus to educate visitors about the balance of nature. Unless zoos want to become completely outdated, they must keep moving forward, both in terms of what they want to achieve and in how they do so.

Froman, R., 1984. Survey of West Michigan Zoos: Cooperation in Education. Paper presented at the Great Lakes regional meeting of the American Association of Zoological Parks and Aquariums, Grand Rapids, MI.

A class of 14, 2/3 over 60, went to three zoos in as many days, learning about the goals pursued by zoos, the way staff are hired and trained, the variety and availability of programs offered, the way zoos function, zoo ethics and the principles and philosophies of zoos and aquariums.

Frye, L., 1977. Walking in Another's Shoes: Exploring Issues of the Museum Visitor's Experience. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Visitor evaluation requires well-defined foci, such as (a) the architecture and the environment (limitations and opportunities, effects on visitor perception), (b) impact of exhibit design (do design techniques obscure or enhance?), (c) what is it all about? (visitor awareness of themes, concepts and ideas; orientation and visitor preparation; differing interpretations stemming from heterogeneity of visitors), (d) finding your way (multiple pathways and levels through the same exhibition for differing visitor interests; ways of looking and choices available to visitors), (e) the human interpreter (touring with an interpreter, visitor as passive or active participant), (f) egress (role of museum objects for the visitor, why people come, understanding multiple meanings objects have for the visitor; objects as cultural symbols, (g) learn, damn you (didactic material--labels, handouts, graphics, media; should an exhibit be like a classroom), (h) relating to the real world (connections to and from everyday life of the visitor; what the visitor brings to the museum experience; reaction to familiar and unfamiliar exhibits, (i) feedback mechanisms for the museum visitor.

Gaulding, M., 1984. HERPlab: A Cooperative Venture. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Washington, DC.

In 1981 The National Zoological Park (NZP) received a grant to develop an informal family learning center. Nicknamed HERPlab, the learning center set out to improve visitor understanding through proximity to the animal collection. Interactive learning materials were to be developed then tested at NZP, the Philadelphia Zoo and Grand Rapids Zoo. A wide variety of evaluative data was collected at the three sites and validated the usefulness of the underlying concepts.

Gennaro, E., A. Bullock, and A. Alden, 1980. Science Learning Experience Involving Adults and their Preadolescent and Adolescent Children. Science Education 64, 3.

In this pilot study a formal course in animal behavior was presented to parents of adolescent and preadolescent children (mean age, 12.4, range 10-14) at the Minnesota Zoological Gardens [MZG]. Twenty five people representing nine families began, 18 (10 adults, 8 children) finished the class, which consisted of discussions, films, demonstrations and activities for 15 hours on five consecutive Saturday mornings. Course goals included understanding environmental pressures, aggressive behavior, imprinting, territoriality and conditioned learning, and improved observational skills.

An inquiry mode of teaching was used, both to reflect the nature of science and to model questioning behavior for the adults. From 15-30 minutes of each class were used for comparing and contrasting animal behavior with human behavior as it pertained to family structure and family communications.

Each family was given a male and female gerbil in a cage for home study during the course. The course participants were asked to make periodic observations during the five weeks of the course using suggested activities contained in home activities packets. The purpose of the home study was twofold: to provide animals that would exemplify certain behaviors discussed

and observed in class and to provide activities for the parents and children to do together.

The questions this study addresses are: Is it possible for preadolescent or adolescent children and their parents to learn science content together so that it is a valuable experience for both children and their parents? What are the attitudes toward learning in this manner?

A test consisting of 15 multiple choice items was administered on the first and last days of the class. The test attempted to measure cognitive understandings of animal behavior. Participants also were asked to rate their learning on each of the goals on a 5-point Likert Scale. Results showed that it is reasonable to assume that learning did occur, as measured by the test (Testing effects and attrition, and the inappropriateness of a Likert Scale to assess cognitive learning, suggest that the evidence for this claim is weak).

Another set of items asked the participants to indicate their agreement or disagreement with statements that focused on the usefulness of class and home activities and the impact on communications in the home.

Finally, participants were asked to "comment on one particularly rewarding experience you have had as a result of this course." Responses were categorized as (1) family-oriented, (2) science-content oriented or (3) combined. Proportionately more adults than children found family-oriented experiences the most rewarding.

Gerace, G, 1980. The North American Mammal Exhibit. Smithsonian Institute. Unpublished.

Tracking and interviews of 50 visitor groups determined that 55% spent 8 minutes or less at the North American Mammals exhibit and that more stopped at the raccoon exhibit, where the animals were visible most of the time than at the skunk exhibit, where the animals often were out of sight. Sign placement affected how much was read. Visitors indicated they would like directions on what, where, when and how to look at exhibits.

Gillett, P. and J. Allen, unpublished paper. Explaining and Predicting Zoo Attendance Levels: A Longitudinal Analysis. Orlando, University of Central Florida.

Zoo attendance is becoming a central concern of zoo managers. But factors contributing to zoo attendance levels are not well understood, making it difficult to estimate a zoo's potential. The study tracks variation in each of eight predictor variables and annual attendance for 46 zoos over a twelve year period from 1974 through 1985. Stagewise multiple regression procedures were applied, resulting in a linear model explaining 76% of total attendance variation found. The most effective predictors of attendance were number of mammal specimens, number of animal species, sunbelt location, area population, and admission price. Zoo acreage and average household income were weak predictors.

Several pairwise interactions among specific subsets of predictor variables also were tested. This nonlinear model explained 85% of total attendance variations and suggested that higher prices are associated with higher attendance levels for larger acreage zoos in more affluent markets. The second model shows worthwhile improvement in explanatory power is reasonably efficient in estimating annual attendance levels for zoos, although other factors could be added to sharpen predictive power of the model. This would require additional survey and observational data.

Gillett, P. and J. Allen, 1987. Explaining and Predicting Zoo Attendance Levels: A Longitudinal Analysis. Poster session presentation at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Short-term forecasting based on recent attendance history, tempered by management judgment, can be effective when zoo environments remain stable. But, zoos planning major changes will find simple trend projection less useful. Using data from 46 U.S. zoos representing alternate years over a six-year period, a nonlinear regression model, using pairwise interrelationships and six variables, explained 86% of the variance. The six variables that proved useful were (in order), population of standard metropolitan area, number of mammal species, number of total species, total number of mammals, admission price, and "Sunbelt" location. Zoo attendance increased with SMA size, with size and variety of animal collection, with a "Sunbelt" location, and with admission price. Zoo acreage and average household income level were not useful predictors.

Mathematical models can help understand and estimate zoo attendance, and require few variables to do so. Model specification still is incomplete as not all variables assumed to be important could be studied. Useful additional variables may include measures of exhibit quality, site location, quality or appeal of animal collection, impact of non-local visitors, constraints such as length of season or parking, and advertising budget level. Finally, more consistent and accurate measures of some variables are needed.

Gilman, G., 1916. Museum Fatigue, Scientific Monthly 12, 1.

Visitors were photographed while examining objects in exhibits to determine the degree of effort various installations required. Shallow eye-level cases were recommended.

Giron, R. and M. Van Diver, 1973. A Keeper Training Program--One Approach. International Zoo Yearbook, 13. London: Zoological Society of London.

After assessment to determine the need for a formal training program for in the US, a zoologist and a botanist initiated such a program at Santa Fe Community college. It was designed to provide training and experience, both basic and innovative, in animal care and park construction, display and management, to produce technicians qualified for management as well as keeper positions. The program leads either to a certificate or an Associate of Arts degree, and comprises 20 different courses: zoo history, zoo ecology and terminology, basic keeper terminology, practicum, wildlife biology, herpeculture, small mammal culture, animal breeding have been offered so far. Planned courses include advanced keeper technology, exhibit design and zoo architecture, principles of zoo education, principles of children's zoo education, zoo guide training, park and recreation management, animal nutrition, aviculture, large mammal culture, and ichthyology. Students work directly with animals from the beginning, but are of course limited and supervised. Expansion to include training for park rangers and veterinary assistants is planned.

Goldman, K., 1970. Opportunities for Extending Museum Contributions to pre-college Science Education. Washington, DC: Smithsonian Institution.

Gottfried, J., 1979. A Naturalistic Study of Children's Behavior in a Free-choice Learning Environment. Berkeley: University of California (unpublished doctoral dissertation).

This study was undertaken to document aspects of children's social and exploratory behavior during, and to assess the educational outcomes of, a science center field trip. Pre- and post-test questionnaires for both children and teachers, detailed observation of a sample of focal individuals, individual and group interviews and peer teaching sessions two weeks after the field trip requiring participants to teach other students about the discoveries that they had made.

The large majority of teachers view science center field trips as enrichment rather than continuation of classroom learning. Children expect to be active, to do and touch things. There was a definite progression of exploratory behavior as the visit progressed which was interpreted as evidence of learning, from observation, through touching and manipulation, to analytic activities, and finally creative activities. Eighty percent of all children who were fearful of one of the animals in the biology discovery room prior to the field trip overcame their fear of the animal to the extent of touching it or picking it up. Individual differences exist in styles of exploration and preferences for novelty. Social factors such as group size and peer cooperation strongly influenced exploratory behavior. Two weeks after the field trip, children were able and willing to teach facts, concepts and skills learned during the field trip to peers and to conduct demonstrations using science center apparatus. Manipulative exhibits were found to attract a greater proportion of visitors, hold their attention longer, and make a greater impact on their memories.

Graburn, N., 1977. The Museum and the Visitor Experience. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Museum professionals are becoming increasingly concerned with lasting effects of museum visits that are not measured by attendance figures and popularity--with effects such as aesthetic, historical, or humanistic awareness. That is, education has become the preoccupation of museum professionals. Graburn addresses the context of the museum in American culture from the perspective of the structural anthropologist,. The examination of the meaning of museum experiences for the general public must take into account the differences perceived between museums, the variety of museums and comparable institutions within the public experience. One function is ritual: to mark personal and family life in a memorable and pleasurable way. Two of the most important contrasts in contemporary Europe and America are those between work (compulsory, serious) and non-work (voluntary, recreational), and that between staying put and the "trip" or outing. Activities can be classified on these dimensions, and can be studied as well in terms of meeting personal needs for reverential, associational and educational experiences. Museums are constantly evolving their functions and expanding their publics, so their position on these dimensions is ambiguous.

Grayson, P., 1985. The Importance/Performance Evaluation: A Formative Evaluation Technique for Education Program Implementation. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Cleveland, OH. Reprinted in Journal of the International Association of Zoo Educators 15, 1986.

Questionnaires provide an efficient way to collect information, provide anonymity, permit respondents time to think, can be given to many people at sites simultaneously, can be mailed, and impose uniformity on the information collected. Disadvantages are lack of flexibility, rigidity, preference of many people for oral response, and difficulty in obtaining high response rates.

A closed response questionnaire that asks respondents to circle pre-selected answers about their expectations and experiences with different program components was used to evaluate an educational program. Data was graphed, and quartiles determined for each question, and compared with program expectations.

Grayson, P., 1984. Herding Your Money Cows and Killing Off Your Dogs: Lessons in Zoo Education Program Management. Paper presented at the Great Lakes regional meeting of the American Association of Zoological Parks and Aquariums.

There are both active and passive educational opportunities available at every zoo or aquarium. Zoos that offer more active, educational programming will benefit from increased revenue, strengthened community support, and greater prestige within the profession.

Educational programs may be classified as Stars that attract large audiences, Money Cows that yield a strong cash flow, Dogs which have poor attendance and lose money and Question Marks that may develop into any of the others. One way to avoid dogs is to screen and evaluate new ideas to insure that each meets a real need, is compatible with the zoo's educational objectives, and is compatible with the zoo's resources.

Greenglass, D. and D. Abbey, 1981. An Analysis of Visitors Responses to Objects in a Traveling Exhibition, Curator 24, 3.

This study addresses qualities which affect interest and attractiveness of museum exhibits. The specific exhibit was "Steuben: Seventy Years of American Glassmaking," at the Royal Ontario Museum, for five weeks during the summer of 1976. Specific aims were (1) to find out which objects in the Steuben glass exhibition did and did not interest casual visitors differentiated by age and sex, (2) to discover what caused visitors to become interested in an object to the extent that they examined it carefully and read the label and (3) to record what reactions to these objects.

Data was collected by unobtrusively sampling conversations of groups of visitors. One of the authors recorded the size of each group and the sex, approximate age and number of its members. He recorded all comments and noted each speaker. The method captures visitor spontaneity, reduces response bias and does not require visitor cooperation. But, only audible, intelligible speech can be recorded and follow-up to clarify visitor meaning is not possible.

To eliminate bias caused by sampling only at particular hours of the day, or on certain days, data were gathered in the morning, midday, afternoon, and evening and every day of the week. Data was collected near objects chosen to

cover a variety of characteristics. including age, style, function, typesize, and amount of engraving. Most subjects in the final sample included groups of 2, 3 or 4 persons , the most common size of visitor groups. The final sample consisted of 1,318 visitors.

Drawing power--the proportion of viewers who comment on an object--was determined by sex and estimated age of visitors. High ranking objects were those produced in limited numbers and often found only in private collections. Low-ranking objects were familiar to the public or could be found in many stores. Holding power--the tendency of an object to promote discussion beyond initial comment--was higher for women than men. Holding and drawing power were negatively effected by crowding.

Remarks about specific items also were classified as negative (2%), favorable (44%), or neutral--primarily comments about label information (54%). Overall comments were classified by content as pertaining to craftsmanship (6%), design (17%), etc., and as emotional (24%), etc. The large number of comments based on labels attests to the importance of this form of written information to the casual viewer. Data also support the need for careful crowd control systems in exhibition halls in which the number of people allowed in an exhibition at any one time is limited to a comfortable number.

Grosjean, G. 1982. Zoo and Aquarium Education: Getting the Message Across. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums, Vancouver, Canada.

Zoo and Aquarium education may be defined as the interpretation of a living animal collection by the zoo or aquarium professional to the visiting public. Factors influencing this mission include the animal collection, the policies of the institution, and the willingness of politicians to provide needed support. Inbreeding and acclimatization to humans means that zoo animals only outwardly resemble wild animals and they are going to die anyway. Under these circumstances, why not present all threatened and endangered species in a museum setting (eliminating feeding costs and reducing staff costs)? The money saved could then be spent breeding animals with special adaptations to our polluted, man-altered environment.

Hall, J., 1987. Landscape Planning for Revitalization of Established Zoos. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

New exhibit objectives and design techniques, emphasizing natural habitats for the animals displayed, have made the "pens and pits" of the older zoo obsolete and unacceptable to both zoo professionals and the public. Older zoos were planned by architects, who emphasized large buildings intended as statements dominating rather than blending into the landscape, which was often treated as an afterthought or a means of decorating the buildings or enhancing sterile exhibits. With the current emphasis on the environment, this relative emphasis has been reversed.

Landscape planning must consider exhibit (thematically related exhibits and viewing areas), public activity (public activity other than exhibits such as entrances and concession plazas), and buffer (areas which provide transition or screen others) zones within the zoo. General design principles are discussed, and additional principles provided for each, including use of canopy, intermediate height and ground plantings and criteria for selection of each, integration with site furniture and graphics, and maintenance.

Finally, landscaping and plantings provide opportunities for horticultural education: the division between zoological parks and botanical gardens is archaic. A low-key program includes identification of major trees with well-designed permanent labels, and theme areas such as food and shelter for birds, plants that attract butterflies, rare and endangered plants, plants used to feed zoo animals, plants that attract bees, evolution, domestication, effects of habitat destruction, and interdependence of animals and plants.

Hamilton, G., 1986. Memorable and Significant: The Total Zoo Experience. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

The development of environmentally aware behavior in people is an on-going process. Memorable experiences, situations, and issues which are of personal significance will contribute most to this goal. Zoos and zoo education should be seen as a component of environmental education. If zoos are serious with respect to their commitment to conservation education, it must be a total commitment not left solely to education sections within zoos. Personnel, public facilities, grounds, enclosures, the animal collection, graphics and publications all should provide positive educational experiences as well.

Hancocks, D., 1980. Bringing Nature into the Zoo: Inexpensive Solutions for Zoo Environments. International Journal for Study of Animal Problems, 1.

Animals in captivity have traditionally been kept in sterile and inappropriate environments. Cages are designed only for restraint of the animals and convenient maintenance by keepers. The behavioral needs of the animals often are ignored. By using nature as a norm, and by using natural materials, the spatial and temporal environment of a captive animal can be enriched.

There are two basic methods of increasing environmental complexity in the zoo: spatially through the addition of furnishings, and temporally through periodic changes in the environment. Adding sand, gravel, volcanic rocks, weathered tree branches, sagebrush and similar items can accomplish much at minimal cost. However, the public sometimes objects to such enclosures because it makes the animal difficult to see.

Live fish and insects often can be used to simulate natural foraging and eating behaviors. However, the public will not accept live feeding of most mammals and birds.

Harding, J., 1979. Comments on the Use of Live, Preserved,and Mounted Specimens in Nature Centers. Paper presented at the regional meeting of the American Association of Zoological Parks and Aquariums, Detroit, MI.

Nature centers as well as zoos, are involved in educating the public about wildlife. Controversy arises over uses of live captive vs. non-living specimens.

Hardy, D., 1984. Improving Educational and Research Links between the University and the Modern Zoo. Northridge, CA: California State University (Unpublished sabbatical report).

A survey of and visits to 17 zoos in 12 states suggests that important opportunities for both zoos and universities to better achieve their own goals exist in formalizing links between universities, aquaria and zoos.

Harting, K., Fall 1987. Checklist for On-Site Audience Surveys. Visitor Behavior 2, 3.

The following checklist was developed in connection with a four-season audience survey at Holden Arboretum:

List all survey dates and hours, develop list of potential volunteers and decide on minimum number needed, send letter requesting participation giving training (Hood, 1987) and survey dates and followup with phone calls. Call volunteers to schedule their working days. Followup with reminder postcards one week in advance of each workday, and hold the training session. Identify type and quantity of all supplies required, and gather them (e.g., tables, chairs, survey instruments, pencils, signs to identify project, badges for volunteers, notepad to list reasons for refusals, notepad to record survey numbers, dates, times and volunteers, etc., depository for completed surveys, boxes to hold supplies, free coffee and tea for respondents and volunteers). Check actual survey site locations, information booklets for volunteers containing instructions, ...). Consider grouping supplies by survey site and date and labeling each for easy pickup by volunteers.

Hatley, J., 1975. Animals Versus Children. In A. P. G. Michelmore, Proceedings of the First International Symposium on Zoo Design and Construction, Paignton, ENGLAND

The title was chosen to reflect a certain amount of conflict that exists between zoos and the children who visit them, but the major purpose is to suggest what children require in zoos. Among these are designs that enable children to view the exhibits with greater ease, and an investigation of the number, type, and distribution of exhibits which children enjoy and to which they will attend. Third, the handicapped child--physically and mentally, including blind and deaf--must be considered. Fourth, zoo book shops should be placed so they will be encountered before the candy kiosk and about half-way through the zoo tour, rather than near entrances as appropriate for adults. Fifth, children need to be able to feel and to smell as well as to see. Sixth, safety is particularly important, and cannot be limited to finger-proof fences. Seventh, there should be facilities for formal classes. Eighth, there must be facilities for school parties too large to be taught directly. Ninth, there must be additional facilities to provide for teacher education, youth club leaders (who need considerable training in how to handle children at zoos) and other groups. Tenth, there should be a number of special exhibits on how the zoo is run.

Hatley, J., 1972. The Function of a Zoo in Primary School Education. International Zoo Yearbook, 12. London: Zoological Society of London.

During the past decade development of a more dynamic approach to primary education has resulted in methods which give sound knowledge of essentials and encourage imaginative use of educational resources. It is against this

background that the zoo visit must be viewed. Facts can be gleaned from books. The first aim of an educational visit must be to stimulate interest rather than to impart information.

Short residential courses for local students are subsidized by the Local Education Authorities. The spinoff value of a zoo visit is illustrated by a diagram suggesting four directions a zoo visit to study body coverings can take. One possibility is hides, leather, conservation, and the tanning industry and bacteriology. Another is feathers, flight, airplanes, air routes and world geography. Another is scales, and reptiles and shedding or fish and friction or insulation. A final direction is hair, insulation and temperature control, lack of hair and the need for clothing, then into cloth production, industry and history, or into clothing design and suitability or care.

Hendron, R. 1984. The Use of Raptors by Volunteers for Education Programs. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Salt Lake, UT.

In 1983, 211 birds of prey were brought to the Hogle Zoo alive but injured. Forty-three percent were healed and released, 43% died or were euthanized, and 13% survived but could not be released. These birds have been used for a decade in education programs by volunteers responsible for training and presentations.

Hensel, K, 1982. A New Look at Our Largest Audience. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Phoenix, Az.

This study examined how external stimuli (exhibits, graphics, programs,etc.) affected visitor behavior on the basis of video tapes, photograph, tape recordings and written summaries of observations. Communication within families was observed to break down after visiting from 4 to 7 exhibits. In the family workshop, parents were more willing to get involved in activities that were not intellectually threatening. Whether or not signs were read seemed to a large degree dependent on the location and context of the materials.

Hill, C., An Analysis of the Zoo Visitor in J. Lucas (ed), 1971. International Zoo Yearbook, 11. London: Zoological Society of London.

The earliest attempts to analyze zoo visitors consisted primarily of defining population limits by turnstyle counts and surveys. Following these simple counting procedures came studies based on population sampling which attempted to determine traffic patterns, popularity of various species of animals, attitudes toward prices and services, group size, average number of visitors per automobile and the areas from which visitors originate.

This study is based on a questionnaire given to 1000 visitor groups to the San Diego Zoo in 1962 consisting of 3562 people including 1038 adult males and 1043 adult females. 450 groups were interviewed on Saturday and Sunday, 550 between Monday and Friday.

A majority of visitors came from a triangle covering the area north of the city to Los Angeles. Many out-of-state visitors had come with friends or relatives who lived in this same triangle. More than 80% were nuclear or elementary families. Young adults (18-35) preferred weekend, and older adults (40 up) preferred weekday visits. Only 5% of heads of household had less than an eighth grade education and half had some college training and almost 10%

had a graduate degree. About 33% were visiting for the first time, about equally divided among out-of-state, triangle and the rest of California. Visitors living in San Diego averaged a visit ever 1.83 years; those from the triangle averaged a visit ever 3.05 years and the mean for the out of state group was 4.01 years.

Forty-two percent of all visitors had visited other zoos in the previous two years, accounting for a large number of large and small zoos throughout the US. Recall of newspaper and miscellaneous mass-media items about the zoo was assessed. Recall of exhibits was determined using five photographs, one of which was not present in the zoo.

Zoo philosophy should be reconsidered in light of high repeat visitor rates. If zoos specialized, the visitor could see more animals than is now possible. Smaller zoos would be helped by such a philosophy. Rather than attempting to copy the exhibition pattern of larger zoos (champagne appetites on beer budgets), specialization would allow large and small to complement one another. But, the key to this philosophy is emphasis, not exclusion. With a little thought, each zoo could show rarities, contribute to overall conservation programs, and raise standards of zoos in general.

The starting point is establishment of a zoo philosophy at the major zoo level. It can be based on climate, ecology, local fauna, taxonomy, history, geography, wealth, research and so on. The survey demonstrates that most visitor groups are young, well-educated, middle class, nuclear families. It is not unreasonable to accept education as a strong motivating force. The question follows whether parents see a zoo as a desirable educational opportunity.

Hodge, R., 1975. Contemporary Methods of Communication (to Increase the Perception of the Participant in the Amphibian and Reptile Display Facility). In A. P. G. Michelmore, Proceedings of the First International Symposium on Zoo Design and Construction, Paignton, ENGLAN

Despite major advances in zoological park communications, herphouses remain at the monotonous "kitchen sink" stage in North American and "greenhouse" approach in Europe. While successful as displays, they fail miserably as interpretive devices. An emphasis on interpretation often is inconsistent with an emphasis on research, which should give way as required, and with keeping large numbers of animals or particularly rare ones. Design details are specified for ten areas into which herphouses may be divided, including husbandry matters such as animal health and interpretive ones such as use of audio, black-lit transparencies, graphics and motion pictures. The entrance features an introduction to herpetology, and the exhibit includes two audio-visual centers at intermediate points, one devoted to reptiles and one to amphibians, making use of readily available--and frequently changing--short films. The major displays include a swamp with a floor-to-ceiling aquarium exhibit with the water surface at eye level dealing with crocodilians; a river exhibit for turtles that protrudes into the public area; a forest and field exhibit of snakes in floor-to-ceiling glass exhibits permitting 360 degree viewing backed by photomurals with heatlamps, branches and so forth to encourage the animals to locate naturally; and four exhibits selected to represent various types of snakes. The desert exhibit emphasizes lizards and includes audio of coyote howls. The stream exhibits salamanders, with water again at eye level, and divided by glass to separate incompatible species. Amphibians are exhibited in a bog, and finally, an exhibit on local fauna emphasizes those found in the zoo's service area. Success should not be measured by the number of amphibian and reptile rarities exhibited or the

number of endangered herptiles induced to breed, but by the number of children whose eyes are opened, the number of students whose quest for knowledge is satisfied, and the number of adults who were meaningfully entertained.

Hodges, S, 1978. A Behavioral Evaluation of ZOOlab Visitors. Washington: Smithsonian Institution (Unpublished report).

Forty visitors were observed, 27 were interviewed, to determine how ZOOlab functions and how visitors respond to the various objects. Eighty-five percent of visitors were in family groups. The average time spent in the lab was 25 minutes, but if there groups in which adults outnumbered children averaged only 11 minutes, while groups in which the reverse was true averaged 26 minutes in the lab. Adult responsiveness to exhibits also was affected by number of accompanying children. Exhibits that permitted touching or dealt with familiar topics (eggs, teeth, diet) were more popular than those unconnected with past experience (how birds eat). Only children became involved with drawing activities; adults merely sat and watched. Hodges suggested that this reflected selection of a (school) activity based on familiarity when faced with many choices.

Hodges, S, 1979. Descriptive Study of the Support Network Underlying Informal Learning. Washington, DC: Smithsonian Institution (Unpublished report).

Length of stay and social behavior of 190 visitor groups was observed at four exhibits (giraffes, seal, seal lion (above and underwater viewing), polar bear (above and underwater viewing) were compared; 15 groups were observed at the zoo's Mane Restaurant. Uniqueness, social interaction among visitors and presence of staff member willing to answer questions increased time spent at exhibits.

Hodges, S, 1979. Report on BIRDlab. Washington, DC: Smithsonian Institution (Unpublished report).

Fifty-three visitor groups to BIRDlab were found to make use of the learning boxes and to ask questions of staff.

Hodges, S., 1979. Responsive Learning Environments in Zoos. Paper presented at the annual meeting of the Animal Behavior Society, New Orleans, LA.

Hogan, H., 1980. Factors Associated with the Attribution of Human Traits to Nonhumans. Journal of Social Psychology, 112.

Assesses the degree to which humans identify with various nonhumans. Findings indicate the four nonhuman species that received the most human-trait attribution were the chimp, dog, horse and parakeet. The species that received the least human-trait attribution were the snake, wasp, roach and earthworm. Women projected more human traits than did men.

Hollenbeck, N., 1984. A Policy for the Use of Contact Animals at the Santa Barbara Zoo. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums, Santa Barbara, CA.

Personal contact between visitors and staff, volunteers and animals enhances the educational impact of zoos. An animal outside normal exhibit enclosures attracts attention and probably results in more learning than in

classroom presentations. The zoo has a well defined policy to convey their respect for the animal and nature, which is spelled out in detail in this article.

Hood, M., 1986. Getting Started in Audience Research. Museum News, 64, 3.

Hood, M., Fall 1987. Preparing Volunteers to Assist in Audience Studies. Visitor Behavior 2, 3.

Using volunteers for conducting audience studies can be profitable if the volunteers are carefully trained and understand that they are a critical segment of the research team. Volunteers should understand the overall research plan, and develop confidence in their ability to carry it out. Since audience research is a legitimate activity, volunteers are instructed never to ask permission or to apologize. Instead, the present the invitation to answer questionnaires as an opportunity for visitors to participate, making respondents feel special, selected to offer their input. Volunteers are provided with stock answers to the most likely questions or objections, but of course never pressure people into responding. The questionnaire is reviewed item by item, and the volunteers complete it themselves to make sure they understand how it works. Guidelines and sampling instructions are reviewed. Supplies (Harting, 1987) are reviewed, and the data collection site actually visited. Volunteers are taught to code questionnaires for data entry.

Hoppes, R., 1985. Educating Humpty Dumpty at the San Francisco Children's Zoo. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Anchorage, AK.

Children's zoos should encourage children to interact with animals and related inanimate objects; children to ask questions about animals; adults to become enthusiastic about animals in the presence of children and adults to volunteer information and observations about animals. Touching exotic animals can be a valuable experience under controlled conditions. The demonstration is the best approach for this activity. There is a place for fantasy early in life. The power of imagination thus stimulated will become the focus for later creativity and problem solving abilities.

Hoppes, R., 1986. Interactive Displays at the San Francisco Children's Zoo: Concept and Design. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums. Tacoma, WA.

The classic zoo exhibit consisted of an animal in a cage, a method that can be likened to a picture with the cage "framing" the subject. Its great advantage was the close view it gave of an animal that was otherwise inaccessible to most people. This approach has been giving way to naturalistic exhibits, which may have been modelled after museum dioramas, permitted the public to experience animals much as they do through travel and the mass media, and combined entertainment and education in one display. Given this background, it is not surprising that zoos are beginning to borrow from technology and the computer to develop interactive displays. Audio-visual equipment, electric eyes, magnifying devices, oscilloscopes and many other scientific apparatus are readily available. Computer simulation, infrared viewing devices, holography and laser discs are but a small number of possibilities that may have a role in exhibit design.

To insure that purpose rather than method drive the decision to use these possibilities, the San Francisco Children's Zoo has developed criteria divided into theoretical and practical concerns, as follows:

Is the interactive technique employed appropriate to the exhibit and the animals? Does the interactive technique complete the educational message rather than eliminate the need for the animals? Is the technology distracting? Does the interactive technique encourage visitors to spend more rather than less time with the animals? Does the interactive technique compliment and support other educational material associated with the exhibit? Does it either encourage humans to behave or perceive like animals, or to deepen the experience of seeing the animals from a human perspective? Has a clear choice of factual, emotional, impressional or subliminal message been selected. Does the exhibit encourage human interaction?

Cost, protection from the elements, location of any special utility hookups, preventative maintenance and cleaning schedules, operating costs, vandalism, repair costs, replacement rate and costs, and security requirements are among the practical considerations that should be addressed.

The traditional barnyard contact area is a long-standing example of an interactive zoo exhibit, involving both animals and equipment such as butter churns. Interactive graphics have long been familiar in museums and zoos and can be as simple--and inexpensive--as lifting a lid to see the answer to a question. Four years ago a squirrel monkey exhibit was designed with a primary cage and irregular wire enclosure placed in a tree with a connecting tube. Visitors expect to see the animals in the cage but usually discover them through noise or movement in their more natural environment. A slide program titled "A Quiz for Humans" on evolution starts automatically when a visitor breaks the beam of an electric eye.

In planning a new exhibit, the integration of an interactive component will aid the zoo educator. The possibilities are endless and need not be excessively expensive compared to other displays. More important, zoos too frequently fill space with "walk by" exhibits which are uncomplimentary to visitors, to the zoo and to the animals we confine in them. Interactive exhibits are not a universal solution, but may be one road open to us for the display not only of the animals, but also for the pride we feel in having those animals available to us for display.

Hotchkiss, N., 1985. Links: A Cooperative Program. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Boston, MA.

Links is an educational program of the Philadelphia Zoo aimed at children in grades 3-5. It provides a model for teachers that integrates all disciplines with an animal-oriented science education, is concept- rather than fact-oriented, provides an in-depth experience the improves on the one-shot visit and encourages the teacher to use the zoo in the less crowded winter months.

Houck, M., 1987. Wildlife in the Urban Environment: Opportunities for AAZPA Involvement. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Urban wildlife habitats are defined as natural, human altered, or human created habitats in cities or rapidly urbanizing areas where 80% of our population will live by the year 2000. Often in spite of, and sometimes because of, man's alterations, a variety of species co-exist with humans.

During the past six years, with a staff of one but many volunteers the Portland Oregon Society has inventoried much of the area for significant wildlife habitat, published The Urban Naturalist to educate the public about local wildlife habitat, established a close working relationship with local park districts to encourage planning for wildlife in local parks, worked with the city council to establish the great blue heron as Portland's official bird, and participated in local land use planning to protect wildlife habitats.

Projects that zoos might take on in their area include assisting in inventorying natural areas, production of a natural resource map including hiking trails, assisting local park districts in management of natural areas, development of plans for area-wide wildlife refuge systems, and develop urban wildlife habitat exhibits in their facilities. To enhance public interest in backyard wildlife I would suggest zoo exhibits relating the human-made environment to species that use it, exhibits of the most common urban species, and incorporation of urban wildlife in zoo education programs. The theme running through all these ideas is, of course, the importance of relating animals to habitat and ecosystem.

Hudson, K., 1975. A Social History of Museums: What the Visitor Thought. London: MacMillan

Outlines the development of museums from the mid-18th century, reconstructing from a wide variety of sources visitor response to collections, staff behavior, buildings and amenities.

Hutt, S., 1977. Direct Observation and Measurement of Behavior. Springfield, IL: Charles C. Thomas.

Iliff, W., 1972. A Keeper Training Project at the National Zoological Park, Washington, D. C. International Zoo Yearbook, 12. London: Zoological Society of London.

This project consisted of three phases. The first phase was to train and upgrade 21 of the lower level National Zoological Park keepers using the course content guide for the instruction of zookeeper training developed by the American Association of Zoological Parks and Aquariums and the New York Zoological Society. This course involved 90 hours of instruction during a 10 week period and covered 20 units including biology, anatomy, physiology, feeding, sanitation, diseases, restraint, behavior, mammals, birds, reptiles, amphibians, fishes, children's zoos and central food preparation.

The second phase of this project consisted of training twelve unemployed adults to gain positions as zoo keepers. This course consisted of lectures, animal observation exercises, construction of exhibits for small animals in the classroom or laboratory and caring for them, and participation with zoo keepers in their work routines.

The final phase of this project consisted of a three-day seminar with 25 participants from zoos throughout the United States aimed at discussing adaptation of the program to the special needs of other zoos.

Iliff, W., 1975. A Volunteer Interpretive Programme at the National Zoo, Washington. International Zoo Yearbook, 15. London: Zoological Society of London.

Junior Zoo Aides were stationed near exhibits of eight endangered animals on summer afternoons to answer questions from the public. These aides ranged from 14 to 17 years of age. In addition, an exhibit of photographs and text at each exhibit described the impact of man on the species. Program brochures directing visitors to these exhibits were passed out at the zoos information booths. This program was successful in its impact both on visitors and in enhancing the knowledge of the aides and of their satisfaction with their knowledge.

International Expeditions, Inc., 1985. Travel and Research Programs. Suite 104, 1776 Independence Court, Birmingham, AL: Author. Unpublished letter and supporting documents.

International Expeditions provides travel and research programs for teachers and teens, with flexible itineraries and content and hands-on opportunities, and on-site naturalist guides.

Goals of the Kenya trip include an introduction to the flora and fauna of the ecosystems including biotic and abiotic features of Kenya, to the physiogeography and topography of Kenya, to explore cultural differences and human adaptations to stressed environments, to learn species identification techniques, basic field research techniques, and nature photography techniques, and to develop teaching techniques and materials appropriate to these materials. Twenty objectives are specified for each participant.

International Union for the Conservation of Nature, United Nations Environment Programme, and World Wildlife Fund, 1980. World Conservation Strategy: Living Resource Conservation for Sustainable Development. Gland, SWITZERLAND: Author.

International Union for the Conservation of Nature and United Nations Environment Programme, 1984. An Introduction to the World Conservation Strategy: Living Resource Conservation for Sustainable Development. Gland, SWITZERLAND: Author.

Jedlicka, D., 1982. Junior Zoo Keepers Association of America. Paper presented at the Great Lakes regional meeting of the American Association of Zoological Parks and Aquariums, Colombus, OH.

The Junior Zoo Keepers Association was formed at Miller Park Zoo (Bloomington, IL) in 1972. The current objective is to develop increased self- and community-pride in elementary school age children.

Jenkins, D., n.d. The Diversity of Life: Continuing the Synergy of Zoo and Museum Design. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Cleveland, OH.

Zoo education is far more than a program: it is the whole experience of a zoo visit. Learning is very complex, differing substantially from individual to individual. Interpretive learning whether through signage and graphics or public touring only reaches part of the total audience. Participatory exhibits, especially those that appeal to all senses and allow exploration of

natural materials, provide another method for learning. Ideally, such exhibits should be incorporated into any new zoo project. Sharing the zoo or museum with other educational services may overcome cost problems. Such facilities can add a new dimension to the experiences of our zoo visitors, and give us increased recognition as an enjoyable learning resource.

Jenkins, D., 1985. Survey of Interactive Technologies. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Cincinnati, OH.

Johnson, D., 1969. Museum Attendance in the New York Metropolitan Region, Curator, 12, 3.

Demographics of visitors to large and small museums in the New York area are reported, providing comparative information for different types of museums.

Johnson, R., Winter 1974. On the Spoor of the Big Bad Wolf. The Journal of Environmental Education, 6.

Describes a study which attempted to determine if adults tend to moderate their childhood views of the wolf, and the differences in attitudes between men and women as well as children and adults. Age was found to be more significant than sex in determining attitudes. Also compares the traditional literary with more realistic perspectives.

Jones, G., 1980. Zoo Design Methodologies According to Bioclimatic and Zoogeographic Principles. In A. P. G. Michelmore, Proceedings of the Third International Symposium on Zoo Design and Construction, Paignton, ENGLAND

Habitat simulation is the key to the validity of a zoo experience. Exhibit integrity should be based on thorough research into the nature of animals and their habitats, extensive discussion with zoo staff and consultants, and follow-through during construction.

In redesigning Woodland Park Zoo in Seattle, the "bioclimatic zone concept" based on the three variables of temperature, precipitation and evapotranspiration was applied to the development of ten bioclimates selected for replication at the zoo. These were tropical forest, savanna, desert, steppe, chapparal, temperate deciduous forest, temperate rain forest, taiga, tundra, and montane. The simplified zones selected were defined in terms of variables such as climate, landform, vegetation, culture, and animals, and a map of the zoo site developed that took account of slope, sun exposure and winter shadows from existing trees to create an "edapho-climate" map showing sites from warmest to coolest. This was adjusted by supplying or draining moisture to create the ten environments selected. Buildings, utilities, circulation and visual dynamics studies led to development of a long-range plan and development guidelines.

The animals for exhibition were selected on the basis of educational value subdivided into social behavior, adaptations, convergent and parallel evolution, and adaptive radiation; interest; representation; research; conservation; and present inventory.

The possibility of interpretive transition from one exhibit to another was taken into account in locating animals and sample tours were developed. Thus, the habitat theme is educationally exciting and overcomes the usual fragmented design process in zoos.

Joslin, P., 1976. Wise Use of Plants in Three Asiatic Zoos. In A. P. G. Michelmore, Proceedings of the Second International Symposium on Zoo Design and Construction, Paignton, ENGLAND

Three design principles in zoo design are (1) avoid straight lines and right angles as they do not exist in nature, (2) avoid uniformity in size and shape of enclosures; and (3) integrate plants with animals to simulate the natural environment.

Jungwirth, E., January 1977. Do Students Accept Anthropomorphic and Teleological Formulations as Scientific Explanations? Journal of College Science Teaching 8.

Results indicated widespread acceptance at face value by students of teleological formulations and anthropomorphic explanations by biology teachers. Implications for teacher educators, textbook writers and teachers are discussed.

Jungwirth, E., 1975. The Problem of Teleology in Biology as a Problem of Biology-Teacher Education. Journal of Biological Education, 9.

Discusses the problem of teleology (attributing purpose to natural processes) and the various forms of teleological interpretations that occur in biology text books and teacher guides. Includes recommendations to biology teachers, educational planners and others on various ways of approaching the problem.

Juvik, J. O., 1977. Mountain Ecozone Exhibits: Design Concepts and Educational Potential. International Zoo Yearbook, 17. London: Zoological Society of London.

Displays that demonstrate how biological communities succeed one another in time offer the ideal format for illustrating the dynamic nature of ecosystem development. Latitudinal , successional or altitudinal gradients might be realistically modelled for an integrated ecozone exhibit. The Panaewa Rainforest Zoo in Hawaii includes such an exhibit simulating Mauna Kea mountain. The underlying educational objectives of the exhibit include illustration of ecological principles utilizing the basic format of biotic responses along an environmental gradient, increasing local familiarity with, and concern for, the islands endemic (and largely endangered) flora and fauna, and illustration of the variety of disruptive influences impacting on natural ecosystems as a result of human action (e.g., pollution, introduction of feral species).

Kafka, H., 1966. Education Programme at Bridgeport Zoo. International Zoo Yearbook, 6. London: Zoological Society of London.

The educational potential of a zoo is enormous but first involves dispelling the popular impression that a zoo visit consists of little more than watching the antics of monkeys. The program consists of two hour tours given by 14 volunteer guides, requiring completion of work sheets at some age levels, and completion of some special project at all levels. These may have more to do with English, spelling, geography and, arithmetic than with animals.

Kaufman, L., 1985. Creating new Interfaces: Steps to Cooperation Between Education and Marketing Departments in Zoos and Aquaria. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Boston, MA.

To educators, zoos exist because people need them, whether they want them or not. To a marketer, zoos exist because people want them, whether they need them or not. By applying marketing principles to educational goods and services, you can get people to want them, even if they don't think they need them.

These groups are frequently in conflict with one another, as the the marketers will create anything that will sell, while the educators think it important to sell only what is worth creating.

As both groups are vital to overall success, it is necessary to bring them together to work these difficulties out. This requires discussion (sometimes on neutral ground!), working on future projects together, and learning how one another work. From this common goals that lead to cooperative efforts can emerge. Interfaces among all groups involved--the curators cannot be forgotten--is vital to creativity and role satisfaction.

Karlin, S., 1986. New Dimensions in Wildlife Education. Paper presented at the western regional meeting of the American Association of Zoological Parks and Administrators. Tacoma, WA.

Kazdin, A., 1982. Single Case Research Designs. New York: Oxford.

Despite the current dominance of multiple case or group designs, experimental psychology originated in single case designs in the work of the father of modern psychology, Wundt (1832-1920), Pavlov (1849-1936), and Thorndike (1874-1949). More recently it is common in the work of researchers such as Skinner.

The most fundamental requirement of single case designs is reliance on repeated observations over time. They are relevant when questions can be answered by frequency measures, rate of response, endurance of response, interval recording (a block of time divided into short intervals and behavior observed during each). Observation can be natural or contrived, natural or laboratory, obtrusive or unobtrusive, recorded by people or automatically.

As in traditional between-group designs, single-case design compares effects under different conditions (independent variables) on performance. Typically, single case designs begin with observing behavior before intervention is implemented, to establish baseline data. Performance without intervention is made by projecting or extrapolating its continuation into the future. The less variability within baseline data the more reliable this

projection is expected to be; the more variability the more difficult it will be to draw conclusions about the effects of the intervention.

The most basic designs consist of a family of procedures designated ABAB, which examine the effects of intervention by alternating the baseline condition (A phase) with the intervention (B phase). Several measures are likely to be taken during each phase, and both phases are repeated at least once in alternation (hence, ABAB). But, an extremely large number of variations have been reported, achieved primarily by varying the order of phases (BABA), the number of times they are repeated, and additional interventions (ABCABC).

Data can be analyzed by t- or F-tests to detect differences when separate phases can be identified. Evidence should be included that serial dependency does not exist. Regression and related time-series methods can be used if the data does show serial dependency. Randomization tests can be used when the treatment can be implemented and withdrawn repeatedly. Rank tests can be used when influence of intervention on different behaviors, persons or situations is examined. Appendix B provides exact procedures for these situations.

Keating, B., 1986. The Zoo's Role in the World Conservation Strategy. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

The World Conservation Strategy, published in 1980, is a 72 page document that directs attention to the increasingly dangerous stresses being put on the earth's biological systems and recommends measures for relieving them. Zoos and botanical gardens worldwide, with the amazing ability to draw large numbers of visitors, can have a significant impact on the general public's awareness and attitudes toward conservation objectives. The strategy points out that, to live in harmony with the natural world, a new ethic is required embracing plants and animals as well as people. If zoos were to cooperate on an international basis using the strategy with the same emphasis now placed on breeding of endangered species, the zoo's ultimate goal of species and habitat preservation would be greatly enhanced.

Kellert, S., 1980. Activities of the American Public Relating to Animals. US Fish and Wildlife Service (GPO No. 024-010-00-624-2).

Explores the size, social characteristics, geographic distribution, and wildlife attitudes and knowledge of various groups of people involved in animal-related activities. Considers groups such as hunters, birdwatchers and pet owners which engage in consumptive and non-consumptive animal-related activities.

Kellert, S. and M. Westervelt, 1983. Children's Attitudes, Knowledge and Behaviors Toward Animals. US Fish and Wildlife Serve (GPO No. 024-010-00641-2).

An extensive study of the attitudes, knowledge and behaviors of 2nd., 5th., 8th. and 11th. grade children toward animals. Results suggest the possibility of distinct stages in the development of attitudes. Implications are discussed in Humane Education, December 1983.

Kellert, S. and J. Berry, 1980. Knowledge, Affection and Basic Attitudes toward Animals in American Society. US Fish and Wildlife Service (GPO No. 204-101-00-625-1).

Examines basic attitudes toward wildlife, knowledge of animals, awareness of wildlife issues, species preferences and broad symbolic perceptions of animals. Variables considered include sex, race, urban-rural residence, religion, education and occupation.

Kellert, S., n.d. Perceptions of Animals in American Society. Paper delivered at 41st North American Wildlife Conference.

The paper summarizes results of a study on American attitudes toward animals conducted over a three year period. Nine basic attitudes were identified, described below as ideal types.

The naturalistic attitude is typified by a profound attraction to wildlife and the outdoors in general. The naturalistically oriented have affectionate feelings toward pets but tend to regard them as inferior to wild animals. An occasional manifestation of the attitude is an atavistic reward from experiencing wilderness as an escape from perceived pressures of modern life.

The ecologistic attitude is oriented toward wildlife but is intellectual and detached, seeing natural environment as a system of interdependent parts. Often demonstrates more concern for species than for individual animals, and usually concerned with mitigating man's impact on natural world.

The humanistic attitude is distinguished by strong personal affection for individual animals, typically pets rather than wildlife. They usually demonstrate concern for all animals, but the concern originates less in general ethical principles than in an extension of empathy from individual pets to animals in genera.

The moralistic attitude is marked by concern for right and wrong treatment of animals, with strong opposition to exploitation and cruelty, but derives less from affection than from ethical principles. The scientistic point of view is characterized by primary interest in the physical attributes and biological functioning of animals and an objective, intellectualized, perspective. Animals are regarded more as objects for study than as subjects of affection or moral concern. Curiosity replaces affection.

The aesthetic attitude tends to be associated with emotional detachment and primary interest in the artistic and symbolic characteristics of animals. For the most part they remain aloof from living animals, preferring paintings, sculpture, movies, poetry, cartoons, etc.). If attracted to live animals, usually involves animal showmanship (bullfighting, fox hunting, dog shows, etc.).

The utilitarian attitude is marked by primary interest in the usefulness of animals for practical or profitable qualities--that is, for benefit to humans. If pets are owned, these usually are hunting dogs, watch dogs, seeing eye dogs, etc.

The dominionistic attitude is marked by a sense of superiority and a desire to master animals. Can involve considerable understanding, but in context of dominating them as in rodeos, trophy hunting, obedience training, etc.

The negativistic attitude includes desire to avoid animals--feelings of indifference, dislike, fear, superstition. Often involves fundamental sense of separation and alienation from animals.

The study also addressed distribution of attitudes in the general population, on the basis of age, sex, race, education, occupation, income, rural/urban childhood, section of country, marital status and number of children. See original for details of complex results.

Kellert, S., 1979. Public Attitudes Toward Critical Wildlife and Natural Habitat Issues. US Fish and Wildlife Service (GPO No. 024-010-00-623-4).

Survey of the attitude of the American public toward selected wildlife and natural habitat issues. Issues discussed include endangered species, animal damage control and habitat protection.

Kellert, S., 1979. Zoological Parks in American Society. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, St. Louis, MO.

Many zoological parks appear to have shifted away from traditional goals of providing aesthetic and recreational entertainment and a related emphasis on large varieties and numbers of species, to simulating natural habitats, increasing space for animals, allocating a larger share of resources to management and propagation and fostering a more biologically knowledgeable and ecologically aware public.

Personal interviews were conducted with 3107 randomly selected Americans 18 and older living in the 48 contiguous states and Alaska, aimed primarily at understanding attitudes of Americans toward animals but reflecting as well on zoos. A remarkable 46 percent reported visiting a zoo during the previous two-year period [similar to the 52% figure reported by Cheek (1976)]. Of these, 15% made six or more visits during the two-year period.

Scales were devised to measure knowledge and attitudes toward animals, using 33 true-false and multiple choice questions selected from among 500 items to insure questions covering every class of vertebrate animals (5 dealt with invertebrates). Zoo visitors had significantly though only moderately higher knowledge scores than the general population, but were substantially lower than all other animal activity groups. They demonstrated relatively limited intellectual and ecological understanding, far higher naturalistic and humanistic attitudes indicating greater than average interest and affection for wildlife, and high moralistic scores indicating sympathy to issues of animal welfare and rights (See Kellert, n.d., for definitions).

The primary reason for visiting zoos for 25% of respondents was interest in animals. Not surprisingly, these had significantly higher knowledge, humanistic, naturalistic, moralistic and endangered species protection scores, and significantly lower negativistic and utilitarian scores, than those coming to the zoo for other reasons. The primary reason for 36% was educational benefits to their children. Approximately 26% came primarily as a leisure activity and 11% reported aesthetic appeal as their primary reason for attending. These seem more oriented toward the social, aesthetic and entertainment values of zoos than the previous group.

Kenyon, K., 1985. Zoo/Aquarium Libraries: A Survey (Part 1). Reprinted in Animal Keepers Forum, 12, 5. (May).

The earliest known aquarists were the Sumerians, who kept fishes in artificial ponds 4500 years ago. Zoos have been in existence at least since Hatshepsut (ca 1475 BCE) brought back a collection of animals from Africa. Royal zoos existed in China around 1150 BC and later in Assyria and Babylonia.

Ptolemy I established the Alexandria Museum, which contained not only a zoo but the first zoological library as well. The earliest zoo in the Americas was established by Montezuma around 1500 AD, and had a staff or 300 keepers. The earliest in the US were established in Buffalo, New York and Washington during the late 1800s; the earliest US display aquarium was opened in 1856 in New York.

The changing and expanding goals of zoos have increased the information needs of zoos and aquaria. 104 U.S. zoos and aquaria reported having book collections in 1981, but only about 40 of these appear to meet the definition of a library not just as a collection of books and serials but also providing information services and having someone with library skills in charge.

The earliest zoo libraries in North America were founded at the Philadelphia Zoo (1874), National Zoological Park (1889), Bronx Zoo (1899) and San Diego Zoo (1916). Most did not come into existence till the 1970s. Most were established by the zoo or zoological society, a few have been started by volunteer docent groups and some began with large donations.

The largest groups of users are permanent staff members (curators, keepers, researchers, educators, veterinarians, pathologists, lab technicians, nutrionists, horticulturalists, administrators, graphic artists). Other users are volunteers, docents, zoo society members, interns and students.

Collections are specialized but cover many topics such as zoology, animal behavior, conservation, ecology, zoo management, zoo design, pathology, veterinary medicine, nutrition, botany and horticulture. Aquarium libraries tend to specialize in seashore biology, fish, invertebrates, marine mammals and aquarium management. Collection sizes vary, from under 200 titles to 9000, with most having less than 1000. Serials range from 0 to 650, with most receiving less than 50 and only 4 receiving more than 200. Two have map collections. Many have slide or photograph collections, and several have reprint collections. Lincoln Park Zoo has a collection of videocassettes and San Diego has oral history tapes. Many keep archival materials such as keeper diaries and logbooks, scrapbooks, letters and newspaper clippings. Needs vary depending on distances from, relationships with and collections of other libraries.

Nineteen are managed by trained librarians, working part- or full-time. Thirteen were maintained by educations specialists and the remainder by other zoo staff including secretaries and animal health technicians. Only ten are staffed full-time.

Kenyon, K., June 1985. Zoo/Aquarium Libraries: A Survey (Part 2). reprinted in Animal Keepers Forum, 12, 6.

The lack of professional librarians limits access to zoo libraries. Ten zoo libraries use the Library of Congress system, 9 use the Dewey Decimal system; 10 use their own system and the remainder have no system. Space and location are major problems. Beyond circulation policies, one or two libraries circulate bulletins to alert staff to journal articles; a few are computerizing their catalogs and a small number have access to bibliographic searches on DIALOG. There is a special interest group within AAZPA to improve networking and cooperation among zoo libraries and a newsletter has been produced three times a year since October 1982 and has a circulation of 170.

Kimcha, L., 1978. Science Centers: A Potential for Learning. Science 199 270-273.

Kimcne discusses the importance of Science Centers as self-motivating experiences in learning through environmental exhibits that appeal to the senses, emotions and intellect. More people visit these museums than any other single type, according to a 1974 survey. There are many reasons why people go to science museums. Attendance is voluntary, visitors can choose their own pace and route, there is no required reading, listening or viewing. Because of its social environment, people go to science museums to share time with family and friends. These museums provide experiences not readily available elsewhere. Museums have a sense of immediacy for at least some areas.

Science museums are the only institutions that can provide the general public with participatory educational programs [SIC!]. Little information exists to determine whether the experiences that people have actually results in measurable advances in learning. Aside from taking pictures no evaluation tools exist to meaningfully register the museum-goers attitude and feelings [SIC!].

Kimmel, P. and M. Maves, 1972. Public Reaction to Museum Interiors, Museum Interiors, 51, 1.

Multidimensional scaling was used to measure visitor reaction to systematic variation in space, lighting, color and other aspects of museum design.

Kinard, J., 1977. The Visitor Versus the Museum. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Kinard argues that the relationship between museum and visitors is a war of the spirit. The museum glories in the number of its visitors, and feels that they come because the museum has something significant. Yet, we do not know how to measure the effects because we don't know what we offer. And neither does the visitor. But, they keep coming. He suggests instead that we seek to discover and define the aspirations, hopes, desires, quests, ambitions, dreams and problems of those who don't visit, because they are in the majority and seemingly have decided museums are irrelevant. Our country and its museums have never told us the truth about Western society because the presentations are written about middle-class white Americans by middle-class white Americans who study and write about what interests them, and this is not of interest to most Americans because our lives are lived striving to achieve self-identity, and to make something out of everyday life.

King, J. and K. Marshall, 1977. Process Notes on a Field Study of the Museum Visitor. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Museums are informally defined as places or institutions that gather, anthologize, or preserve any visual information for public evaluation. In the San Francisco area these include such diverse institutions as the prison park on Alcatraz Island, the Wax Museum and the California Palace of the Legion of Honor. The facade or identity varies from cultural temple to circus side-show, and the external image or facade projected accurately the potential

experience inside and exerted a selective force in attracting an audience. Signs varied widely in number, clarity of information and graphic presentation, and added to the ambience characteristic of each institution and that institution's concept of its audience. They denoted the type and number of people anticipated, the amount of active participation desired, and how much security and traffic control was necessary. Generally they included exhibit labels, general information (hours, fees, etc.), traffic control (entrance, restrooms, etc.) and security (don't touch, etc.). The audience could be categorized by social grouping and by reactions or interactions, whether active, passive, social, instructional, contemplative, diversionary, etc.

Kinville, C., 1968. Oklahoma City Zoo's Education Programme. International Zoo Yearbook, 8. London: Zoological Society of London.

The main objectives of the education department are to teach people about the importance of wild animals and to make the zoo an integral part of the individual's understanding of life. The education program is integrated with the curriculum requirements of science classes of the Oklahoma schools from kindergarten through 12th grade. Guided tours, special classes, a summer program for economically deprived children, and a mobile program for the physically handicapped and institutionalized elderly make up the major components of the program.

Kirschofer, R. 1981. Graphic Designs as Aids to Teaching in Zoos. International Zoo Yearbook, 21. London: Zoological Society of London.

Frankfurt Zoo is using talking labels, graphic designs, revolving globes, slides and sound films to supplement its more traditional signs. Many of these are intended specifically to enlarge the teaching discussions and broaden the approach that takes place at the exhibits, or deal with information not easily learned from viewing live animals. One example is a see-through graphic painted on the viewing window of the bird house food preparation room that shows how pollutants build up in the food chain. Another is an exhibit on the structure and function of the eye in higher mammals. A film loop provides a closeup look at activities inside the leaf-cutter ants' nest that would be too small to be seen live.

Kisling, V., 1976. Dissemination of Scientific and Technical Information Generated by Zoological Parks and Aquariums. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Baltimore, MD.

Publication of scientific and technical information is becoming increasingly expensive and time consuming, particularly if each zoological park and aquarium attempts to do everything independently. Alternatives exist that are innovative and viable solutions to the problem, providing effective, coordinated dissemination of the information in a manner that would be useful and beneficial to the zoological park community. Among these are the International Species Inventory System [ISIS], the Smithsonian Science Information Exchange [SSIE] and the Wild Animal Propagation Trust [WAPT].

Kovach, C., 1978. A Hungry Problem for Zoos: In Search of New Prey. Los Angeles, CA: Graduate School of Management, University of California (Unpublished Working Paper Series #67)

Marketing research associated with public not-for-profit organizations is relatively rare and rests largely on business-oriented theories and concepts. These are rarely examined for "goodness of fit," and are adjusted only incrementally. The time may have come for a more radical rethinking. With this in mind, the zoo is used as a catalyst. This allows a more vivid understanding of the sector and its needs and for a more creative way to open the boundaries and assumptions held by many marketers by building on synectics. In this approach, problem solving is approached metaphorically and new "product" development is taken as the framework for examining business-generated theories and their implications for the NFP sector. Ideas examined are the product/mix portfolio; lifecycle and packaging.

For purposes of this paper, the formal product (service offered) is defined as "a view of the animals" and the core product (benefit offered) is "enjoyment and education." The augmented product would be a combination of core and formal product plus the sale of toys, film and food and rental of strollers, cameras and so forth and the total "gestalt" suggested--the park-like setting, etc.

The "generative product" consists mainly of the animals and the exhibits, including devices such as signs to help the public appreciate and understand the animals and the rationale behind the particular exhibit. For example, how many animals should be in a particular exhibit? Is it sufficient to have one or two bisons or are they best seen as a herd. Should species be mixed in a single exhibit?

Theoretically, an organization can determine depth and width of its product mix. But in the case of the zoo, this mix is not an internal decision. Budgets seldom provide for new animals or exhibits, renovations, etc., which typically require outside funding of some sort. Animals are not easily moved from one exhibit to another, making it more difficult to change than, say, a museum. Zoos have prescribed boundaries beyond which the noise, smell and presence of animals must not stray, and disease problems, exhibit size and maintenance requirements limit the number of animals displayed. Safety, climate, equipment, fuel and food costs constrain what animals can be kept. All these constraints must be fully understood in developing a collection. A few zoos have chosen to adopt product-line specialization (e.g.,, Arizona-Sonora Desert Museum), a limited product-line (Santa Barbara Zoo) or a special-situation (Seaworld [aquatics and research]) but these are relatively rare compared with the number that have the full-line, all-market strategy.

The product-mix decision must include the conventional ones of breadth (number of different animals) and depth (number of each animal). Constraints such as climate may require some null cells. The concept of product life cycle may be adapted to the zoo situation by further classifying animals as newborn, acquisitions, rare or exotic, unusual groupings, new exhibits and new means of communication (including signs, guided tours, and display techniques). A fourth dimension is visitor attitude and receptiveness toward each animal (which may be long-term or temporary, planned (an independent event such as a visiting museum exhibit) or unplanned (the escape of the hippo Bubbles). Thus, changing the way a popular animal is exhibited may be more cost-effective than obtaining a new animal. Finally, the marketing concept of saturation (the market has so many competitors that it cannot absorb more) is perhaps better replaced by the concept of satiation (the number of times a

visitor will visit the same zoo, or at what point a single visit becomes boring or exhaustion sets in). The zoo hopes not for one-time or infrequent, but for frequent visitors. Thus, it must understand how to overcome satiation over the long rather than the short term.

Kovach, C., 1978. What Do You Mean: "It's Like a Zoo?" Paper presented at the meeting of the Academy of Management, San Francisco, CA.

If organizational theories are to be generalizable, then it is inappropriate to ignore some types of organizations because of a perceived misfit with the generally accepted range of researchable organizations. One such case is the zoo, commonly used to embody the notion of a crazy, disorganized, untidy and chaotic place.

Change has not come easily or rapidly in the zoo industry, and is largely a function of changed expectations on the part of the public. Zoos in Europe came into existence for the amusement of aristocrats. They became available to the masses following the French Revolution, but the animals were objects of fun, often of cruelty and abuse. The emphasis on tricks and performances led to considerable anthropomorphizing. In an era before tv and movies when only the rich had books, wild animals were far stranger than they are today. One notable exception was the London Zoo, founded for scientific reasons and opened to the public only when financial difficulties led to a need for additional funds. Several other zoos followed this trend, which began the evolution of the modern zoo. Another important influence was Carl Hagenbeck of Hamburg Zoo who pioneered the now-widely-accepted norm featuring open exhibits and moats.

As a preliminary step, three conceptualizations of boundary permeability, based on its sector, are posited. First, the concept of private sector is eroding as companies grow and become more crucial to the functioning of society. In contrast, public sector is designed to be permeable to the public who need to gain access to services or to challenge policies or operations, but the degree of permeability varies among specific public services. Finally, the not-for-profit sector represents a mixture of both public and private characteristics. Zoos are unique in that they are found in all three sectors. This provides an unusual opportunity to examine the impact of sector on boundary permeability, which may be defined as the extent external forces may penetrate the boundary of an organization in system terms. A second relevant concept is underorganization, defined as the degree of autonomy of sub-units relative to information flow and decision-making. Note that this is not the same as disorganized.

One reason zoos are underbounded is that their public funding usually only covers part of their costs, while the balance stem from a related not-for-profit association. Thus, there is a dual authority system, with the balance of power and degree of interdependence varying from one zoo to another. Thus, it is likely that the more dependent the legal owner is on the supporting organization, the more permeable will be the boundary. The more permeable the boundary, the more time required to manage this boundary. If over time it weakens, the host organization may change places with the assisting one. One reasons zoos are underorganized is that zoos are characterized by very different units (birds vs. mammals, etc.). Further, each keeper is relatively autonomous. This vests greater flexibility in each employee, which in turn increases the possibility for catastrophe. It also is proposed that unique organizations which become defensive due to catastrophes or innovations become overbounded, as both risk system collapse.

Zoos do not pay salaries commensurate with the qualifications and efforts of their employees, yet extra hours without pay commonly are readily volunteered and absenteeism without illness is minimal. There is a sense of duty, responsibility and pride found in other charismatic organizations. This leads to the proposition that the greater the charismatic qualities of an organization the greater the tendency to use this as a rationale for not paying wages in line with similar jobs elsewhere. Further, the more underbounded the organization, the greater the possibility for civil service mentality (employee rights rather than responsibilities) to overshadow the intrinsic motivational forces inherent in charismatic organizations; while the more bounded the system (independent from government control) the more likely the employees will be proud of their association with the zoo and the greater the temptation will be to exploit the employees in the name of the charisma of the organization or the needs of the animals. Further, the more charismatic the organization, the more potential there is for employee rivalry to exist in non-promotional areas. The smaller and less professional the organization, the greater this problem is likely to be.

Zoos are unique in that they are members of many industries but belong to none. They are in education, research, medical, conservation, preservation, exhibit, recreational, cultural and entertainment industries. But none exactly welcomes them with open arms. They thus are extremely underbounded when it comes to influences from these many sources. This leads to the proposition that the greater the number of "industries" associated with an organization the more underbounded it is likely to be. Further, the more unique it is the greater will be its difficulty in obtaining legitimacy in a boundary industry. But, the more unique the organization, the greater its potential for leadership in the boundary industry. San Diego Zoo is the outstanding example, recognized as a leading cultural and recreational institution, no mean feat for a non-profit organization competing with the myriad competitors in southern California. Finally, organizations which are charistmatic or unique are less able to control their media boundary.

Zoos are very permeable. They suffer from being associated with too many industries, and being peripheral in some respects to all. The underbounded nature makes change difficult. It cannot get funding for needed improvements because it is not considered to be as crucial as competitors in each of its associated areas.

Kuehl, P. G., 1976. An Analysis of Visitor Socioeconomic, Behavioral, and Attitudinal Characteristics at the National Zoological Park. Washington, DC: National Zoological Park (Unpublished report).

The demographics of National Zoological Park [NZP] visitors were studied through 903 personal interviews using different forms for different age groups.

NZP visitors in the 13 and older gr p had above-average education and income, were predominantly white and non-Spanish speaking, recognized the educational role of animal exhibits, and tended to visit other zoos and natural history museums. Compared with visitors from outside the city, local residents visited frequently but did not stay as long and sought out different exhibits animal.

NZP visitors in the 5 to 12 age group frequented the traditionally popular animal exhibits, were more interested in animal habitats than range maps or physical attributes associated with animal habitats and came 1 to 3 times during a 12 month period with members of their families, often as part of a school program.

Kwong, D., 1976. Lion-Tiger Area Observation. Washington, D.C: Smithsonian Institution (unpublished report).

Thirty-one group interviews and 100 trackings were conducted to determine which signs in the lion-tiger exhibit areas were being read and why. Single signs were read more often than multiple ones and those with photos were read more often than those without photos. Many visitors entered the alcoves only to look at large, color photos or to drink from the water fountain.

Kwong, D., 1977. The Crowned Crane Trail Study. Washington, D.C.: Smithsonian Institution (Unpublished report)

Interviews of 122 visitors and tracking of 75 groups before and after visitor trails were marked out at the National Zoological Park [NZP] 122 interviews were conducted to determine how self-guiding trails were used by NZP visitors. These trails consist of footprints of various types of animals, each leading to a different area of the zoo. The trails did not affect the exhibits where visitors stopped, but did affect direction. For example, before trails were groups at one intersection chose equally between the two directions; afterwards, 43 followed the trail while 23 did not. But, self-guiding information was used irregularly by visitors, with those interested in birds making little use of them at all.

Laetsch, W., 1980?, An Overview of Research on Museum Visitors in J. Glaser (ed), Proceedings of Children in Museums: An International Symposium. Washington, DC: Smithsonian Institution.

Laetsch, W., 1982. Taking a Measure of Families. Roundtable Reports, 7, 1.

The most rudimentary fact noted is that zoos rank at the top of the list, art museums at the bottom, in popularity among parent-child groups visiting such institutions. Exhibits account for a trivial amount of total time and visitors questioned about similar places visited often include such activities as picnics, suggesting that the educational experience in a museum or zoo often takes second place to social interaction within the groups. In examining the learning interchange between parent and child, one of the author's students determined that "telling" was the prevalent teaching mode for father-son dyads, and "showing" was dominant between mothers and daughters. Another student found that familiar animals trigger stories and that questions discussed in family groups are concrete and rarely deal with abstractions such as taxonomy or ecological relationships.

The idea of starting with the known and using that to organize and assimilate new information and concepts is a well-developed principle of Jean Piaget. It is possible that he might eventually have the same influence on the conceivers of exhibits that he has had on classroom educators.

Lakota, R., 1975. National Museum of Natural History as a Behavioral Environment. Washington, DC: Smithsonian Institution Office of Museum Programs.

Twenty-two halls of the Museum of Natural History were defined as a system. Its output was defined as the behavioral effects of its elements on visitors. The first task was to measure this output by establishing behavioral performance criteria based on the ability of exhibits to attract visitors and hold their attention. The environmental aspects of the system

were defined in terms of the physical arrangement of the exhibit halls, their subject matter content and design characteristics.

The scientific purpose was to determine how well the behavioral functioning could be accounted for on the basis of its measurable environmental characteristics. The practical objectives were to determine why some halls function better than others and what can be done to improve the performance of those that function poorly.

Randomly selected groups of visitors were tracked throughout their visit and significant behavior recorded (sequence of hall visitation, number of stops within halls, level of interaction with displays and level of exhibit directed social interaction), relations among these behaviors were identified and used as a basis for developing measures of exhibit performance.

Two such measures, attraction and holding power, were used as performance criteria with adult visitors. A single criteria, effectiveness, was developed for visitors groups which included small children. These groups were found to be behave in rather different and more consistent ways than adult only groups.

The studies developed indices for hall accessibility, subject matter (interest, familiarity and visitor awareness of content) and design, density of objects, organizational basis for selecting and displaying objects, new and innovative display techniques and didactic techniques).

Through regression analysis, those characteristics were identified which added significantly to an explanation of the behavioral effects of the museum on visitors. It was found that attraction was a function of interest, location and spaciousness; holding power was a function of familiarity, new display interest, location and awareness; and effectiveness was a function of familiarity, location and the use of didactic techniques.

On the basis of these findings, diagnostic profiles for each of the exhibit halls were prepared, furnishing specific information about hall strengths and weaknesses. General suggestions were made for physical orientation, conceptual orientation and exhibit design techniques which were likely to improve overall hall performance.

L. LaMarca, 1987. Fundraising Through Special Events. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Most zoos are doing promotions, and those that are not hope to in the future. They range in number from a few a year to the two dozen planned by the Audobon Park Zoo, and come in infinite variety. Some do them as part of a well thought out marketing plan, and those that "catch-as-catch-can," usually with the excuse that they do not have the staff, but in reality probably because they have not yet made the commitment to do them well.

There are many factors involved in special events. Usually it means competing--professionally--for media and corporate sponsorship to cover costs and marketing. It means creativity in identifying the kinds of events appropriate to your community and facility--and perhaps improving your facility to make some events feasible. It means anticipating and dealing with problems associated with each type of event in advance. But, it is worth while in terms of increased attendance, increased per capita spending, a higher community profile, increased sponsorship opportunities, advancement of educational goals, and enhanced experiences for visitors.

Landry, S., 1985. What It Is!: Putting Together a Good Label System. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Boston, MA.

Labeling the contents of exhibits is critical for two reasons. The first is that while we learn at least some names and appearances of exotic, warm-blooded animals along with our alphabets--from aardvarks through elephants to zebras--fewer among us are familiar with orawantas, electric eels and zebra fish. Second, within an aquarium, the public is often presented with numbers of species mixed together in one exhibit. As with birds displayed together, this presents designers and the public with identification challenges. For these reasons it is particularly important for us to try to overcome these "naming" problems with a well-designed label system. The primary goal is to inform the audience of what they are looking at and to do this attractively within our darkened interior. The major approach is through accurate paintings.

Larrabee, E., 1968. Museums and Education. Washington, DC: Smithsonian Institution Press.

This book summarizes papers from a 1966 conference on Museums and Education. A historical perspective is provided. Emphasis is placed on the role and responsibility of the museum as an educational resource within the community. Since this book was written at a time of unrest and social change in our educational and economic system it reflects a concern over attracting members of all social and economic strata. Museums are categorized, types exhibits are defined and attitudes towards each are discussed.

Lattis, R. L., n.d. Animal Shows...An Educational Impact. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums.

Lattis compares the process of visiting a zoo with that of moving from the reader of an advertisement through the sales prospect to purchaser of a product. Just as it is necessary to speak to a salesperson to obtain answers to questions, so the zoo must go beyond exhibits and labels and provide personal contact to meet the needs of visitors. Improved labels and graphics, self-guided tours and the like do not offer the important element of personal contact. Zoo tours provide this contact, but reach only a small proportion of zoo visitors.

One way to reach more people is through zoo shows. The Bronx Zoo is producing three types of show. The simplest is an hourly program to provide young children with basic information about animals. The second takes place at an animal exhibit, usually coupled to the regular feeding time, and involves a professional trainer who uses operant conditioning to demonstrate particular adaptations and behaviors of animals. The third involves animals trained for stage performance, uses animals donated to the zoo by owners who grew tired of them, and uses this fact to make points about the responsibility of pet ownership and the burden of the pet trade on wild populations.

The latter is the most controversial purpose, so its impact was evaluated professionally, and found to drastically reduce the percentage of people thinking that parrots make suitable pets, while increasing their understanding of difficulties of keeping them. Signs providing the same information were found to be much less effective in reaching the same understandings.

Laule, G., 1985. A Behavioral Enrichment Model for Zoo Animals. Carson, CA: California State University, Dominguez Hills. Unpublished masters thesis.

To test the potential of environmental enrichment as a means for preventing or reversing behavior problems common in captive animals, and secondarily to enhance the educational impact of exhibits and keeper involvement in research, a program of inservice keeper and staff education and training of sea lions aimed at behaviors that would reduce stress during necessary veterinary and husbandry procedures was tried with favorable results at the Santa Barbara Zoo.

Lawrence, E., 1986. Relationships with Animals: The Impact of Human Culture. Phi Kappa Phi Journal, 66, 1.

Human interactions with animals are to a large extent determined by culture, which shapes perceptions and behavior. One animal that has been significant to many peoples over the world across time is the bear. Campbell claims that "the earliest evidence anywhere on earth of veneration of a divine being is the Alpine bear-skull sanctuaries of Neanderthal Man." Bears were admired for strength, courage, and intelligence. Among Gypsies, bears have magic powers for curing, and originally was the offspring of a virgin girl. Bear-baiting (using dogs to fight chained bears) once was popular in England, and Spaniards in California pitted bulls against grizzlies (later the bear became the symbol of the short-lived republic and now is on the state flag and emblem. The belief in among orientals of curative powers associated with gall bladders and the rating of paws as an epicurean delight leads to poaching for the California market today. Bears were used to test the B-58 escape capsule--then killed.

It was traditional for frontier heroes to conquer a bear early in their careers, not for food but to prove strength and virility and to affirm human supremacy over nature. Davy Crockett, Daniel Boon, Lewis and Clark, Zebulon Pike, Stonewall Jackson, General Custer, and Theodore Roosevelt all are associated with such stories. The intensity of feelings about grizzlies even today remain intense, as demonstrated anytime proposals are made to set aside wilderness refuges for them. The animal is the focal point of protest by western lumbermen, cattle ranchers, sheepherders, miners, oil drillers, and land developers, who generally resent government interference and believe in full exploitation of all resources for the material benefit of people.

Lehman, L., 1986. Integrating the Subject of Wildlife Trade Into Your Zoo Education Curriculum. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums. Tacoma, WA.

TRAFFIC (USA) is World Wildlife Fund's program for monitoring illegal or excessive trade in wild plants and animals. This subject lends itself well to education. Habitat destruction may be the most serious threat to species survival, but it is remote from the average US citizen. But, illegal wildlife trade is substantial, poorly understood, and particularly appropriate in zoos that exhibit the species involved. Special zoo activities aimed at informing the public about the trade can be combined with materials, exhibits and fact sheets developed by TRAFFIC staff. A zoogoer may understand, but cannot do much about tropical deforestation, but stopping illegal trade is a tangible problem in which an individual can become involved and can help solve.

LeResche, L., nd. What People do at the Zoo: An Ethological Study of Zoo Visitor Behavior. Baltimore, MD: Baltimore Zoological Society (unpublished report).

Levy, S., 1976. Visitors and Exhibits at Omsi: A Survey. Portland, OR: Oregon Museum of Science and Industry (unpublished manuscript).

Determined demographics of visitors attracted to particular exhibits, the mean time spent at each exhibit for each sub-group and ranked exhibits in terms of popularity based on time spent at each.

Linn, M., 1981. Evaluation in the Museum Setting: Focus on Expectations. California University, Berkeley. Lawrence Hall of Science, National Science Foundation, Washington, D.C. ED 206 636.

It is suggested that to communicate effectively, evaluators in museum settings must be collaborators with the people they serve, to understand the inherent conflict of interests, and design an evaluation which enhances interstaff communication. Four factors are considered essential for conducting a successful evaluation; 1) The evaluator should have a detailed knowledge of the museum setting, which will act as a key to effective communication; 2) The evaluator should have the ability to understand and handle conflicts of interest resulting from individuals' vested interests in conflicting outcomes (hypothetical perspective of a museum director, fundraiser, curator, board of directors, exhibit designers, funding agency, museum education department head, and museum evaluator are presented); 3) The evaluator should focus on relevant policy issues where he can have the greatest impact. For example, the museum's capacity to make provisions for learning and entertainment; and 4) The investigation should be planned to have maximum impact with limited resources. The ultimate goal of museum evaluation is stated to be museum policy improvement and representation of public interests without forcing the museum to compromise its values.

Mistakenly, some evaluators have treated museums as schools. Although museums have educational properties, they differ greatly from schools, and museums must exploit these differences. Since museum attendance is by choice, museum evaluators must determine "Who comes?" "Why do they come?" "Should visitors be recruited?" "How should museum programs respond to visitors' needs?"

In conclusion, a better understanding of both the role of the museum and the role of its policies and policy-makers is of great importance if the evaluator wishes to have an impact on policy. Policy changes, once instituted, tend to prevail. Evaluators realize that no single study can provide a definite answer for social policy. The right evidence can initiate discussion and changes which ultimately lead to a new policy.

H. Litwak, and D. Kaestle, 1987. Which Way is the Polar Bear? Planning Site-Signage Programs. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Principles pertinent to developing a comprehensive visitor communication program are presented. These begin with multimedia advertisements to interest the public in coming to the zoo and highway directional signs to help them find it. They should include printed collateral materials such as zoo maps, food stand menus, and even tram tickets, and items sold in souvenir shops including guide books, posters, and toys. A comprehensive signage program

includes highway signs, parking lot indicators, entrance signs, and ticket booths. Once inside, it should include all visitor services including food, souvenirs, restrooms, exhibit identification, maps on site, maps handed to visitors, medical facilities, donor signs, directional signs, animal and plant exhibit identification and interpretive signs, traffic control signs, special event signs, and directions to the exit.

Factors in making signage decisions include philosophy, placement, structure and installation, function, material (glare, texture, ease of fabrication, durability), color (legibility, intrusiveness, coding systems, connotation), and typography. Finally, the needs of children, seniors, and the handicapped (wheelchair access, viewing height, audio volume, vocabulary, color blindness) must be taken into account.

Typeface and size has a lot to do with legibility and clarity, and can be varied to signal different types of information. Colors and materials convey messages, affect clarity, and vary in durability. Some zoos use special elements, such as animal sculptures to identify habitat areas or architecture to identify regions. Symbols may be overcome language problems, but also may prove confusing. An excellently designed sign in a poor location, or obscured by plants, does no good at all. Too many signs turn your paths into billboard-laden highways; too few leave the visitor bewildered. Maps handed out at ticket booths should match those around the site, and much thought given to their orientation: many visitors find plan view maps difficult to follow. Landmarks in the zoo indicated on the maps help visitors as gathering and reference points. Exhibits change: animals go on and off exhibit, but keeping the signs up-to-date is difficult. Nobody has come up with a better system for plant identification than little plaques but surely we can do better. The planning and design of public informal spaces can be learned from the Disney organization. Within the context of a total budget for site-signage, it is relatively inexpensive to protype aspects of your program, and to see how your visitors actually react to them.

Liversidge, J. and E. Hozore, 1984. Part I, Preliminary Investigations. Information and Agenda: Strategies for Enhancing the Studies Research Project. Washington, D.C.: Smithsonian Institution (Unpublished report).

Observation of 417 families at 12 exhibits and tracking of 100 visitors were conducted to to collect baseline data on families visiting the National Zoological Park. Individuals in 158 families were observed reading signs. Twenty-six percent read the signs out loud, and only 7% of the families were classified as thorough readers.

Livingston, B., 1974. Animals, People, Places. New York: Arbor House.

This book includes chapters on many aspects of zoos and their history. There are descriptions of different types of zoos, including the traditional zoo (e.g., San Diego), the private zoo (e.g., William Randolph Hurst), and the drive-through zoo. Notable personalities such as Carl Hagenbeck, the animal trade, capturing wild animals (from Queen Hatshepsut to Frank Buck), breeding in zoos, superstars (e.g., giant pandas and the Baltimore Zoo's painting chimp), controversial issues and the future direction zoos may take all are addressed.

Loomis, R., 1987. Museum Visitor Evaluation: New Tool for Management. Nashville, TN: American Association for State and Local History.

Discusses the nature of visitor evaluation and its relationship to management, suggests uses in museums, describes various methods for collecting and improving attendance data, provides a basic rationale and guidelines for conducting visitor surveys, relates off-site surveys to marketing plans and determining why people do or do not visit an institution, provides ideas for exhibit evaluation including label reading and consistence of circulation patterns with interpretation goals, and discusses the use of evaluation to improve programs. Loomis has included sample surveys and forms.

Loomis, R., 1973. Please! Not Another Visitor Survey. Museum News 52. 2.

Suggests reasons museum personnel are dissatisfied with visitor surveys and suggests ways to design more incisive research. Six foci of past research are demographic and attendance measures; access and decision-to-visit, museums as social institutions, exhibit evaluation, management and educational services.

Loomis, R., 1974. Social Learning Potentials of Museums. Symposium of the American Educational Research Association. ED 093 787.

Museums are undergoing changes as institutions which may cause them to adopt a more community and socially-oriented course of programs in addition to their traditional roles of scholarship and preservation of important artifacts. This change, coupled with the fact that museum visitation is a highly social activity, raises some interesting possibilities for the evaluation of learning in non-traditional environments. It also calls for an emphasis on the social learning basis behind the use of institutions such as museums. To facilitate the awareness of these social learning potentials, more information is needed about museums as institutions; how they reach and develop their audiences; the social nature of museum visiting; and socially based learning criteria for museum settings. In addition, innovative strategies in evaluation and some kind of theoretical framework are needed (author).

To improve understanding of social process it is suggested that a learning system be utilized to supply the social history dimensions of artifacts and displays. This system could include the use of computers in exhibits. Exhibits could thereby be made to simulate social interactions between the visitor, the past, the present and the artist via video-tape recordings. Visitors could be encouraged to participate and test their knowledge about the exhibit.

At the present time there is little or no theoretical work available that attempts to integrate what is known about museum behavior. Melton (1935) produced a number of generalizations about visitor movement and attention span in exhibit halls. Weiss and Botourline (1962) provided a start at a model of crowd flow in exhibition settings. Other studies by students are also cited herein which emphasize the influence of physical environment on behavior and how that relates to the way in which visitors move through the museum environment.

Lupton, D., 1978. Zoo and Aquarium Design. Council of Planning Libraries, Serial No. 1484, Serials Department, Colorado State University Libraries.

The intent of this bibliography (1880-1977) is to provide a general overview of sources of information concerning zoo and aquarium design. The sources cited attempt to identify specific studies pertaining to zoological gardens, aquarium, aviaries, wildlife parks, safari parks, oceanariums, and children's zoos. A variety of aspects of design have been represented, ranging from indoor exhibitions, facilities, structures and materials, quarters for specific animals, remodeling to landscaping. In some cases the cited material deals with total zoo design.

McCann, P., 1977. Development of the Education Programme at Lincoln Park Zoo, Chicago. International Zoo Yearbook, 17. London: Zoological Society of London.

In the absence of a staff Curator of Education, Lincoln Park Zoo has relied on volunteers to act as the zoo's educational arm. As the program developed, a formal docent training program with admission requirements, coordination with the Chicago Board of Education, development of grade-specific classes, and supporting committees (research, membership, newsletter, public relations and education committees) emerged. In addition to zoo tours and courses, the program includes participation in a book fair and a Travelling Zoo

Malcarne, V., March 1983. The Boston Study. Humane Education.

This study measured the impact of four different humane education treatments on fourth and fifth grade student's attitudes toward animals. The treatments included (1) repeated lessons and materials by in-class teachers and a visiting educator; (2) intensive one-time presentation by a visiting educator; (3) humane education reading materials without instruction and (4) no reading material or instruction. Results indicated that the repeated treatment was most effective and the intensive one was effective. The other treatments had no impact on student attitudes.

Malcarne, V., 1983. Empathy and Humane Education. PO Box 363, East Haddam, CT: National Association for the Advancement of Humane Education (mimeographed).

A review and analysis of literature on empathy, altruism, and ways in which empathy with animals can be promoted. Methods include role-play, participation in distress experiences, emphasis on similarities between animals and humans, inductive discipline and exposure to empathic and altruistic role models. The benefits of frequent direct interaction with animals also are discussed.

Malcarne, V., 1981. What Can Humane Education Research Do for You? Humane Education.

Discusses ways in which humane educators can utilize subjective and objective evaluation techniques to assess the effectiveness of humane education programing Reports on a study that found role-playing to be an effective means of increasing children's empathy with animals and with other children.

Marcellini, D., 1986. Conservation with a Big C. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

There exists a world conservation crisis and it is the result of an expanding and increasingly consumptive human population. It is this crisis that zoos must begin to address. Conservation with a Big C involves taking care of the world's resources by limiting population growth and changing life styles. Zoos have avoided these painful and difficult issues. There are a number of barriers to treating these serious issues in zoos, such as conflict with their recreational role and the feeling that zoos already are doing their bit

through breeding and education programs. However, zoos are an ideal place to present the broader issues because of the size and nature of their clientele and because they provide a window to the wild world. Zoos must take advantage of their unique opportunities to communicate conservation issues by presenting appropriate messages and by practicing what they preach.

Marcellini, J. 1976 Reptile House Tracking Study. Unpublished. Smithsonian Institute.

Twenty groups of visitors were tracked to assess visitor behavior in the National Zoo's Reptile House after new signs were installed. The average time spent in the Reptile House was 9.7 minutes; the average number of exhibits stopped at was 19; the average time spent at each stop was .44 minutes; the mean number of signs read was 14.2 out of 92 possible; and the mean number of keys read out of 80 was 3.04.

Marjoribanks, K., 1979. Families and their Learning Environments: An Empirical Analysis. London: Routledge & Kegan Paul.

Martin, A., 1986. Do Zoos Have a Role in Conservation? Does Count Dracula Have a Role in Managing the Blood Bank? Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Zoos do not, and as presently constituted, cannot have a primary or significant role in conservation. Zoos have always been, and undoubtedly will continue to be, places of recreation. We may choose, if we wish, to conceive of zoos as multiple-resource centers, but as with any multiple-use facility, one role always come to predominate. That role, in zoos, in not conservation. Zoos should cease their excrutiatingly self-righteous posturing about conservation and allow themselves and their visitors to enjoy them for what they are: entertainment centers.

Martinovich, P., 1984. Report on Preliminary Study on the Small Mammal House Brochure. Smithsonian Institute. Unpublished.

Ninety-four groups were interviewed to determine whether and how visitors used a brochure designed to help them. 18.3% read it fully, 25.8% read it partially, and 57.0% did not read it at all. Negative comments were that there was too much text and not enough pictures. Topics not covered that would have interested visitors included behind-the-scenes information on the zoo.

Mayer, W., June 1982. Guidelines for Educational Priorities and Curricular Innovations on Issues in Human/Animal Interactions. A BSCS project sponsored by the Geraldine Dodge Foundation.

Questionnaires were sent to large samples of secondary students and teachers to determine knowledge of animals, views of ethical decision making, attitudes toward animals and use of animals in the classroom.
Results indicate indifference to and deficient knowledge of human/animal interactions on the part of both teachers and students surveyed.

Melton, A., 1935. Another Study of the Effect of Increasing the Number of Exits, in A. W. Melton, Problems of Installation in Museums of Art. Washington, DC: American Association of Museums, New Series, 14.

The purpose of this study was to determine if direction signs influenced the routes taken by visitors in a museum. It was first established that in the absence of a sign 73.3% of visitors entering a gallery turned right. 99.5% of visitors complied with a sign at the gallery entrance directing them to turn to the right. A linear decrease in compliance was found as the sign was moved further from the entrance, to 89.3% at a distance of six feet. 90.5% complied with a sign at the gallery entrance directing them to turn to the left, declining to 65.8% as the distance of the sign from the entrance was increased to six feet.

As signs only partially overcome the natural tendency of visitors to turn right, it is more effective to design exhibits to be seen in the order visitors will take naturally.

Melton, A., 1935. The Effect of Asymetrical Placement of Exits and the Effect of Increasing the Number of Exits. in A. W. Melton, Problems of Installation in Museums of Art. Washington, DC: American Association of Museums, New Series, 14.

The purpose of this study was to determine whether the position of exits effect routes of visitors in an art gallery. Unaccompanied visitors were observed in a gallery under two conditions: first, the only exit was in the center right wall; second, another exit was opened in the far left wall.

Under the first condition, 82.9% of the 105 visitors observed turned to the right upon entering the gallery; under the second condition 79.3% of the 246 visitors observed turned to the right. Under the first condition 64.2% of the visitors passed only those paintings located on the right wall before exiting. Under the second condition, those attending only to paintings on the right wall declined to 43.5% although few visitors actually used the exit on the left. Opening the second exit partially counteracted the right-turn tendency of visitors and increased the proportion of paintings seen by visitors to the gallery.

Melton, A., 1935. Studies of the Factor of Position in a Large Symmetrical Gallery, in A. W. Melton, Problems of Installation in Museums of Art. Washington, D. C.: American Association of Museums, New Series, 14.

The routes taken by randomly selected unaccompanied visitors to a gallery of Flemish and Dutch paintings were recorded to determine how often each painting was observed. Observations were conducted under three different arrangements of paintings to control for the drawing power of specific paintings.

Of 926 visitors observed, 71.5% turned right on entering the gallery. Paintings on the right wall received more attention than those on the left, regardless of the arrangement of the paintings. 62.6% followed the right wall until they came to an exit, and took it without ever having crossed to the left side.

Melton, A., 1972. Visitor Behavior in Museums: Some Early Research in Environmental Design. Human Factors, 14, 5.

This article summarizes methods of influencing museum visitor behavior using design and spatial factors, based on the author's pioneering studies beginning in the 1930s. In these studies, variables such as the location, signs, and period exhibits were manipulated to influence visitor reactions, routes and time spent at exhibits. Isolated objects were given more attention than those in a crowded hall or exhibit. Period style installation did not increase attention to the main object, perhaps also because they too give visitors too many things to attend to.

Mills, R., 1973. A Different View of the Zoo. Parks and Recreation, 8, 3.

Marketing approaches and specific strategies aimed at increased animal and patron satisfaction are explored in this article. The upgrading and diversification of exhibits is viewed as essential to their success. A shift towards atmospheric displays, which show many animals together in a setting suggestive of natural habitat, is a trend which the author favors. The author feels that such exhibits maximize educational benefits. Adequate promotion of the zoo is vital to continued public interest, and the article outlines the pitfalls of promotion campaigns. Extension of zoo services to include slide presentations, animal acts, and traveling exhibits is said to afford greater access and information to the public. The hours of operation are evaluated in terms of attendance enhancement.

Mitchell, J., 1980. The Hunt. New York: Knopf.

A nicely balanced but anecdotal study of the many types of American hunters, and of their underlying attitudes toward animals which may be loosely summarized as ranging from the sublime to the ridiculous.

Michelmore, A., 1976. The Basic Needs of an Educational Zoo. In A. Michelmore, Proceedings of the Second International Symposium on Zoo Design and Construction, Paignton, ENGLAND

Topics such as the nature of the zoo collection for educational purposes, the role of endangered and common species, the arrangements of exhibits, display techniques, plants, enclosure size and animal visibility, animal contacts, and explanatory matter are addressed. The collection for an educational zoo must not merely be large in numbers of species and individuals, but must be carefully selected to be varied and representative. It should, as far as possible, include representatives of the main taxonomic groups, from all the main climatic types of the world, of every important geographical region and habitat. Similarly, all the main habits of animals should be represented--such as diet, motion, social structure, and adaptations. The collection should be selected to facilitate discussion of specific topics, such as evolution, that arise in the educational program.

Michelmore, A., 1976. The Spider Web Zoo. In A. Michelmore, Proceedings of the Second International Symposium on Zoo Design and Construction, Paignton, ENGLAND

Zoo layout based on the orb web can accomplish several goals, including separation of visitor from service traffic, communication and control by the

director, ease in handling bulky materials and waste, reduction of heating costs, and exhibit coherence. A large number of practical ideas, such as placing the garden department as near as possible to animals that produce high quantities of manure, are included, and adapting the idea from a flat site to a valley is discussed.

Monroe, D., 1977. Museums: Constituencies and Change. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Museum visitors arrive with expectations, interests and attitudes and they depart with certain benefits. yet museum professionals remain ill informed about them and cannot say with assurance that their programs have been successful or that the benefits the visitors derive are similar to those intended by the staff. The assumption that increased attendance indicates increased effectiveness is unwarranted in view of contrary explanations such as increased leisure time, higher levels of average educational achievement and greater mobility.

There are several factors which can be readily identified to account for the apparent lack of concern on the part of museums to ascertain the quality of their public services: a long association with the social and educational elite, a tradition which has stressed research and the repository/preservation functions, lack of adequate financial support, a proliferation of small museums capable of only the most rudimentary operations, and the multidisciplinary nature of museums. But these factors all are changing and the quality and value of visitor experience must be a fundamental institutional concern. Several corollaries can be extracted from this axiom: the need for systematic feedback from visitors; the need to understand why visitors learned from, enjoyed and appreciated exhibits; the need to involve such expertise as educators, psychologists and sociologists in exhibit design; the need to integrate information and data into exhibit design; and the necessity to define the shared expectations and objectives of the design team to assure integrated exhibit design.

Morgan, K., Fall 1983. Latham Letter. San Francisco: Latham Foundation.

Morris, D., 1960. An Analysis of Animal Popularity. International Zoo Yearbook, 2. London: Zoological Society of London.

Approximately 50000 postcards were received at the London Zoo in response to a television program in which young viewers were asked to vote for the animal they liked most and the animal they liked least. Of these, a sample of 2200 entries from 100 boys and 100 girls from each age group between 4 and 14 were examined. Animals disliked included snake, spider, lion, rat, crocodile, skunk, gorilla, hippopotamus, rhinoceros and tiger. Animals liked were monkey, chimpanzee, horse, bushbaby, giant panda, bear, elephant, lion, dog and giraffe.

Morris, G., 1986. Will Zoos of the Future be Relevant? Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

The title of the paper implies that zoos today are relevant--relevant in terms of achieving their objectives of conservation education, recreation, research and those other nice-sounding ideals for modern zoos in contemporary

society. The enormous popularity of zoos throughout the world would appear to attest to the fact that zoos today are relevant, though it is not clear why they are so popular. Will they be popular tomorrow? It is unlikely that anyone--apart perhaps from zoo staff--is ever educated at a zoo. it is equally unlikely that many people become educated about the world's fauna and conservation issues confronting society, until they have visited a zoo. Zoos appear to have little real, but high intrinsic, value.

Murray, C. H., 1932. How to Estimate a Museum's Value. Museums Journal, 31.

Time spent by visitors is used to determine the success of exhibits and visitor responses.

Nash, G., 1975. Art Museums as Perceived by the Public. Curator 18, 1.

This study explored the reasons why so small a proportion of New Yorkers attend the relatively accessible and inexpensive art museums of the state using three research strategies: interviews with people in downtown Rochester and Manhattan's East Side to determine the images they hold of museums, interviews with people who had just completed visits to the Whitney Museum and an in-depth investigation of the community outreach programs of the memorial Art Gallery of the University of Rochester.

Nedzell, L., 1952. The Motivation and Education of the General Public Through Museum Experiences. Chicago: University of Chicago (unpublished doctoral dissertation).

Neilsen, L., 1946. A Technique for Studying the Behavior of Museum Visitors, Journal of Educational Psychology, 37.

Time-lapse photography was used to determine how many visitors entered a museum gallery, how many were there at any given moment, where they went and in what sequence, how they looked at the exhibits, how long they stayed at each exhibit and in the room as a whole. But, the method alone does not yield a complete picture of the visitor, but only of behavior in specific situations. Questions as to what prompted the visitor to come, his or her emotional set or fatigue level, require other techniques.

Niehoff, A., 1953. Characteristics of the Audience Reaction in the Milwaukee Public Museum. Midwest Museums Quarterly, 13, 1. And, Niehoff, A., 1959. Audience reaction in the Milwaukee Public Museum: the Winter Visitors. Midwest Museums Conference Quarterly, 19, 2. Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum.

Two hundred forty five visitors age 10 and up completed questionnaires identical to those in a study of summer visitors (Niehoff, 1953) aimed at determining who visits the museum, what they do during their visit, and the relative popularity of the exhibits. Over fifty percent of visitors were below age 19 (vs. only 35% among summer visitors), and only 3% were 50 or older. Seventy-eight percent were from Milwaukee and its suburbs (vs. only 48% during the summer). Visitors were asked to list up to three exhibits that most interested them. Fifty five exhibits or areas of interest received between 1 and 97 votes, the rankings being almost the same as that found during the summer. One factor influencing this choice is just how much of the museum each visited. Only one-third visited all three floors, and a

comparable number visited only the first floor. The impedance offered by a flight of stairs is more clearly seen in that exhibits listed among the three favorites were on the first floor in 267 instances, the 2nd floor in 24 instances, and the third floor in 10 instances. Categorized another way, life-size dioramas were mentioned 159 times, specimen exhibits 79 times, and miniature dioramas 47 times.

Forty-six percent of visitors reported spending one hour in the museum, while 23% reported two hours and 8% reported spending more than two hours. One third had made no visits during the previous year (vs 62% among summer visitors), while nearly half reported five or more visits per year (vs only 20% among summer visitors).

Nieland, K., 1985. Challenges to Zoo Planning--A Perspective. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Anchorage, AK.

One challenge to zoo planning is the challenge of clearly defining goals. Any planning effort is goal oriented. Though effective planning is needed even to maintain the status quo, plans generally are formulated to implement change--perhaps an increase in program effectiveness, a solution to operational problems or establishment of new programs and facilities.

A second challenge to planning lies in the ability to effectively communicate goals and to communicate methods through which we intend to realize them. To successfully plan for the challenges facing zoos, an ability to understand, define and communicate our professional goals must be shared by all members of the zoo team.

Noonan, B., 1981. Assessing the Merits of Contemporary Zoo Graphics. International Zoo Yearbook, 21. London: Zoological Society of London.

Well-conceived graphics can help explain the part zoos play in conservation, especially that of captive breeding programs. Every display, sign and folder should assert what we think of ourselves as an institution. Graphics can be a fundamental aid in explaining the role of the modern zoo.

Norton, B., 1985. Learning from Nature: Zoos in a Technological Age. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Oklahoma City, OK.

Norton presents eight points bearing on the role of zoos today. (1) We inhabit a fast changing world in which natural systems are being "converted" to human use. (2) Rapid changes in our physical world have significant effects on the collective modern psyche. (3) in a related and concurrent trend, it is easier to view nature and wild species as nothing more than commodities. (4) ecological and evolutionary theory establish a picture radically at odds with the trends 1-3. (5) We should value wild species and ecosystems because they provide analogies for understanding human options. (6) the way out of this tangle is for us to rediscover the wonder of life, and our own participation in the process. (7) if we do so, we no longer will see living things as mere commodities and (8) living wild things do have a value in their own right.

When ecosystems are managed for human purposes, they no longer are wild. Thus, while zoos and zoo personnel can provide invaluable auxiliary aid in the battle to save species, they cannot assume direct responsibility for that task without entirely altering their central focus and purpose. Zoos contribute

importantly to the effort to save wild species but cannot succeed without help. This is not a failure of zoos, but of society. Attitudes and values lead to behaviors that threaten more and more species. The responsibility to preserve wild habitats and species must be accepted by society at large.

The central function of zoos, therefore, should remain educational. In pursuing this goal, educational programs at zoos must recognize that this is more a matter of will and attitude than factual knowledge about animals. That is, the can and must attack the problem indirectly by creating a revolution in attitudes.

O'Connor, P., 1967. Educational Programme at Staten Island Zoo. International Zoo Yearbook, 7. London: Zoological Society of London.

The Staten Island Zoo has concentrated on educational programs for the community since its opening in 1936. Teachers may select from among lecture-demonstration-tours to meet the needs of their classes, which may range from pre-school to college. A behind-the-scenes tour of the zoo is available for small groups. Weekly biology classes are held on Saturdays for high school students selected by their teachers. A well-equipped teaching laboratory is maintained and teaching films are obtained from the City and State health departments. Zoo staff may give outside lectures at hospitals, schools, service clubs and other civic and youth organizations. Zoo members are provided with a once-monthly lecture by outstanding authorities on various aspects of natural history.

O'Donnell, H., April 1980. ERIC/RCS Report: Animals in Literature. Language Arts, 57.

Surveys and summarizes recent essays and books on animals in children's literature. Notes that, as children mature, they become more interested in stories that depict animals more realistically.

Office of Education, 1978. Visitors's Reactions to New Signs in the Bird House. Unpublished.

Tracking and 9 personal interviews were conducted to find out what kind of signs attract visitors. Interviews were limited to those who read a sign about Colonel Sanders (of Kentucky Fried Chicken).

SIGN (visitors)	WALK PAST (%)	GLANCE (%)	READ (%)
Col Sanders(228)	99(43.3)	37(16.2)	92(40.4)
Sextant (219)	172(78.5)	29(13.2)	18(8.2)
Sonograph (206)	176(85.4)	21(10.2)	9(4.4)
"Orders" (206)	187(90.8)	17(8.3)	2(.9)
Courtship (205)	175(85.4)	22(10.7)	8(3.9)
Metabolism (180)	154(85.6)	25(13.9)	1(.5)
Senses related to Flight (148)	126(85.1)	18(12.2)	4(2.7)
Territory (128)	118(92.2)	8(6.3)	2(1.6)
Kiwi Shoe Polish (92)	50(54.3)	21(22.9)	21(22.9)

The higher percentage of people reading the Colonel Sanders and Kiwi Shoe Polish signs is attributed to the surprise at finding them in the zoo and to the familiarity of the products.

O'Reilly, J. and J. Shettel-Neuber, nd. The Aviary: An Evaluation of Visitor Usage. Tucson, AZ: Arizona Sonora Desert Museum.

Ollason, R., 1981. The Animal Labeling System at Edinburgh Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

Each enclosure at the Edinburgh exhibit carries at least one, and sometimes as many as three labels, of uniform size, background, color (blue) and method of framing, consisting of illustrations and white lettering. The illustrations depict the animal in its natural habitat, providing information such as preferred food, particular behaviors and species distribution. Text always includes information on habitat, gestation or incubation, number of young, and diet. A second set of signs being developed is aimed at young children, and are placed at the eye-level of 6-7 year-olds and always on an orange background.

O'Reilly, J., J. Shettel-Neuber and J. Vining, 1981. The Use of Post-Occupancy Evaluations for a Continuing Assessment Program in Museums. In A. Osterberg, C. Tiernan, and R. Findlay (eds), Design Research Interactions. New York: EDRA, Inc.

Parr, A., 1968. Information Vocabulary, Motivation and Memory. Museum News 46, 9.

Parr, A., 1969. Marketing the Message, Curator, 12, 2.

Parsons, L., 1965. Systematic Testing of Display Techniques for an Anthropological Exhibit. Curator, 8, 2. Reprinted in Borhegyi, S. and I. Hanson, 1968, The Museum Visitor. Milwaukee: Milwaukee Public Museum Publications in Museology.

An anthropological exhibit dealing with the influence of environment on technology and using utilitarian objects such as spoons, buckets and ladles, was designed to test the effectiveness of three exhibit design factors. The first factor contrasted conventional declarative labels with interrogative labels (answers were provided in a corner of the case). The second factor was visual complexity, manipulated by gradually adding photographs, maps and labels to the case displaying the objects. The third factor contrasted color, through exhibits that contained earth-colored objects and black-and-white labels with brightly colored objects, print colors, color photographs and the like. Questionnaires were used to collect data from more than 2000 visitors.

Results were not as dramatic as anticipated. The formal didactic exhibit was very slightly favored over the interrogative, do-it-yourself variations, but even if this is not a chance variation, it is not sufficient to say that one or the other is more effective. It would be more appropriate to conclude that both can be used to achieve variation. Visual complexity and well-filled exhibits was strongly preferred to simple exhibits, supporting the intuitive feelings of Parr and others. Participants rated the neutral colored displays as "too plain" but they were highly rated on other factors tested and were equally effective educationally. Overall, the study suggests that it is more important to match exhibit techniques to purpose than to seek design factors in some routine fashion in all cases.

Parsons, M. and R. Loomis, 1973. Visitor Traffic Patterns, Then and Now. Washington, DC: Smithsonian Institution Office of Museum Programs.

Paterson, D., Christmas Term 1980. Children's Ideas on Animals--A Preliminary Study. Humane Education Journal, 3.

Backgrounds, knowledge of "animal nature" and certain areas of cruelty to animals of British school children was found by questionnaire to reveal generally humane attitudes combined with often inconsistent behavior toward animals.

Pearce, P. and G. Moscardo, June 1985. Visitor Evaluation: An Appraisal of Goals and Techniques. Evaluation Review 9, 3.

The current state of visitor evaluation research in museums, natural environments, tourist sites, and tourist facilities is considered in turn. The most striking issue to emerge is the importance of articulating research goals. There is room for both theoretical researchers, who must ask whether their study unambiguously tests a relationship between key variables, and applied researchers who should aim to avoid reactivity as they must ensure that their explanations relate to normal behavior and experience. Overall it becomes clear that research aimed at "understanding the visitor" is likely to be the worst of all--uninformative, expensive and wasteful.

Methodologically, two points warrant attention. First, there could be a much more imaginative use of alternatives to the visitor survey such as unobtrusive measures, simulations, mini experiments, field experiments, participant observation and rule-breaking studies. Much work would profit from a triangulation of research methods. Second, data sets should be thoroughly explored once they are obtained. Many researchers would be envious of the sample sizes in much visitor evaluation research, yet a lot of this material is not even cross-tabulated. Techniques of particular relevance include discriminant analysis, factor analysis and multidimensional scaling.

Peart, B., 1983. Are Dioramas the Answer? An Evaluation of the Living Land-Living Sea Gallery at the BC Provincial Museum. Ottawa: National Museums of Canada (unpublished report).

Peart, B., 1984. Impact of Exhibit Type on Knowledge Gain, Attitudes and Behavior. Curator, 27, 3.

Early museum exhibits were arranged as "collections" with no order whatsoever. As the emphasis shifted from scholarly research to exhibitions and public functions, collections were ordered and displayed in context with each other. Museums now use a variety of display techniques and are attempting to put exhibits in appropriate contexts. But, how effective are these techniques in achieving the goals established for them?

This study presented a single exhibit five different ways to determine which had the greatest effect on knowledge gain, attitudinal change, attracting power, holding power and interaction. 56 subjects were observed and interviewed for a control and progressively less abstract and more concrete exhibits (word only, picture only, object only, object with sign, object with sign and sound). No significant difference was found between control group and the object exhibit in knowledge gained: when the label was removed, visitors were unable to gain knowledge related to the exhibit message. Percent of correct responses increased from 38.4% to 71.4% as the exhibits became more concrete. Slight but inconclusive evidence was detected that the magnitude of previously held attitudes may have been strengthened but exhibits did not change them, regardless of type.

A significant difference in attracting power was found between word and picture exhibits (at 23%) and object, standard and sound exhibits (55, 61 and 91% respectively), and a significant difference between sound and each of the four other exhibit types. A significant difference was found in holding power (percent of visitors staying long enough to look at exhibit and read sign) between word, object and picture exhibits (43, 47 and 69%) and the standard and sound exhibits (77 and 79%). A significant difference in interaction among visitors was found between word and picture exhibits (2% each) and object, standard and sound exhibits (11, 14 and 29%). In summary, as exhibits become less abstract and more concrete, they attract and hold more visitors and promote more interaction among them.

In conclusion, exhibits that are concrete are more effective than abstract ones in attracting, holding and informing visitors. Exhibits do contribute to knowledge, but vary in effectiveness based on the way they are presented. The more direct the experience, the more concrete the exhibit, the more interpretive the label, the greater are the attracting power, holding power and interaction among visitors. Good labels are critical: once attracted to an exhibit, it is the label that most determines exhibit effectiveness. As attitudes are difficult to change, the goal should be reinforcement.

Phillips, D., 1978. Abandoning Method. San Francisco: Jossey-Bass.

The purpose of this book is to bring to the attention of those studying social sciences, "a series of empirical studies of bias and invalidity in sociological research." This topic is of paramount significance because invalid measurement inevitably invalidates conclusions. What constitutes sociological information is examined along with the usefulness of falsification and paradigms; each concept being explored individually and in relation to sociological research overall. This book explores the issues of bias, improper methodology and objectivity. A closer relationship between science and social research is advocated.

Piper, J., 1987. Can We Design Learning Into an Exhibit: New "Basics" for Planning Exhibit Interpretation. Paper presented at the annual western regional meeting of the American Association of Zoological Parks and Aquariums, Fresno, CA.

The African Rock Kopje is the first exhibit in the San Diego Zoo's long-range plan to rebuild the zoo in bioclimatic zones. A multidisciplinary interpretive team was assembled to combine verbal and nonverbal elements to reinforce concepts using established principles of communication. The concepts themselves were selected on the basis of a needs assessment that identified visitor characteristics and led to the selection of convention-goers and mothers with children as the primary audience for the exhibit (resulting, for example, in the addition to the exhibit of a touch pool and sandbox). Cognitive, affective and experiential goals were identified and 15 specific objectives selected. The exhibit was designed with these in mind, and labels were written to present adult concepts in 7th-8th grade language using Rudolph Flesch's guidelines. Provision was made for, and an external evaluation of the exhibit was carried out when it opened, that will provide much of the needs analysis for the next exhibit to be designed.

As the first interdisciplinary exhibit design at San Diego Zoo, it also involved rugged individualists learning to work as a team. Unlike a sports team whose members have the same goal (whether it be touchdowns or homeruns), individuals had very different goals, such as animal management, immersion of the visitor in a landscape, or interesting the visitor in a message. Scientists want to be exact, which requires qualifiers; writers want to gain attention, and abhor qualifiers. Values of each are sound and important, but often contradictory. Yet these conflicts of professional values turn out to be the main strength of the team approach because they result in exhibits that are at once accurate, meaningful, safe, easy to maintain, affordable and fun. Exhibit interpretation is scientific, creative, and artistic: very much like composing a symphony--devising variations on several themes in counterpoint.

Piper, J., 1986. Mind Reading Made Easy: Needs Assessment Evaluation. Journal of the International Association of Zoo Educators, 15.

An introduction to the systems approach to instructional design, emphasizing identification of intended audiences in demographic terms; use of records, published literature, experts, and observation, and development of appropriate instruments.

Porter, M., 1938. Behavior of the Average Visitor in the Peabody Museum of Natural History. Washington, DC: Yale University.

The exhibits on the first floor of the Peabody Museum of Natural History at Yale University are arranged to show the continuity of life. This study sought to determine if a guidance leaflet affected the degree to which casual visitors followed the intended sequence, the time spent at each exhibit, and the onset of museum fatigue.

The leaflets resulted in an increase in the length of time spent at exhibits, in the number of exhibits viewed (whether mentioned in the leaflet or not), and in the number of labels read. But, a logical sequence of exhibits is not sufficient to insure that visitors will adhere to the intended viewing pattern. The leaflets reduced museum fatigue and object saturation. The behavior of visitors given leaflets was significantly different from visitors not given leaflets despite a relatively small sample and considerable variation within both groups.

Poulsen, H., 1974. Notes on the Value of Zoo Guide Books. International Zoo Yearbook, 14. London: Zoological Society of London.

Zoos are interested in providing visitors more information than experience suggests they will linger to read from exhibit labels. The solution at the Copenhagen Zoo has been to keep signs brief and interesting but to provide two guide books for interested visitors. One is a pocket book of systematic biology enumerating the characteristics of the various orders, families and species found in the zoo. the other contains basic facts answering common questions and short anecdotal descriptions of particular animals in the collection.

Powell, D., 1974. Colours Beneath the Sea. International Zoo Yearbook, 14. London: Zoological Society of London.

One aspect of the sub-marine environment not demonstrated until completion of a display at Sea World is the visual change that occurs with increasing depth. Sea water progressively filters out red, yellow, green, blue and finally indigo light. The effect varies considerably with the organic and inorganic content of the water in particular areas. Kodak filters have been fitted to floodlights to approximate the light-filtering curve in the Caribbean at four depths, and buttons provided to allow visitors to vary the "depth" at will.

Powell, C. and R. Powell, 1982. The Predator-Prey Concept in Elementary Education. Wilderness Society Bulletin 10.

The role of education in the development of attitudes toward predators was studied by interviewing children and surveying teacher attitudes and knowledge. Findings suggest that children are ready to learn about predation sooner than most teachers and authors now presume.

Prague, R., 1974. The University Museum Visitor Survey Project. Curator 17, 3.

A survey of museum visitors included three phases of data collection. 100 visitors who appeared to be over 14 were selected and approach by a spotter and interviewed individually by an interviewer while other members of the interviewees group waited at a table. 100 unguided individual visitors

were observed to determine flow patterns, total time in the gallery, time at each exhibit and unusual behavior if any. Unstructured questionnaires were given to visitors and tabulated by arbitrary major categories of response. 95% of the sample was white, 74% under age 31, and 92.5% had some college education. Occupation levels were also high. 38.6% stayed an average of one to two hours per visit. 55% were students, 32.9% were frequent visitors, 74% came from within 40 miles of the museum. The museum was criticized for lack of publicity, difficulty of access due to limited parking and inadequate mass transit, the need for planning to guide and improve visitor traffic flow, and greater awareness by the staff of visitor reaction to placement of displays in the galleries. displays in the galleries.

Proctor, S., 1969. Education Programme at Vancouver Public Aquarium. International Zoo Yearbook, 9. London: Zoological Society of London.

Two types of programs are available. Guided tours are given to visiting 5th-8th. grade students and a laboratory class stocked with live animals is used by 11th. grade biology classes. The latter centers on animals living in the intertidal region of British Columbia. One morning is spent answering questions about four species of live marine animals. Answers are discussed with the students by the teachers on their return to school.

Quinn, H., 1972. Education Programme at Fort Worth Zoo. International Zoo Yearbook, 12. London: Zoological Society of London.

The education program began as a club for fourth graders, evolving into a weekend movie program, then into formal courses. An Explorer post is based at the zoo, with the scouts assisting the veterinarian, supervisors and keepers as a means of acquiring occupational knowledge and skills.

Rabb, G., 1985. Facing up to Conservation Education. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Columbus, OH. Reprinted in Journal of the International Association of Zoo Educators, 15.

Zoo and aquarium staffs in general are aware of and wish to face the challenge posed by the issues of conservation and education. It is our charters,a dn it is practiced in our Species Survival Plans. But, most of us also feel that we're not getting the message across to the public. Recognition of both the complexity and magnitude of the task are the major sources of frustration we feel. It is not sufficient to have naturalistic exhibits or innovative educational programs. Rather, it is necessary to invest and commit more to revolutionizing our communication with the public.

We already know a great deal about this task. We know something of our audience, and of the even larger group we do not reach. We have information from Kellert and others that the opportunities to affect attitudes are limited, but primarily involve the young, parenting adults through peer pressure, and through trend-setters and leaders. There is no feeling of immediacy, ownership or proprietary rights, much less of stewardship or responsibility. We are inconsistent: we cannot espouse consumerism and waste, then expect conservation of remote and obscure species. The zoo must practice what it preaches through recycling, composting, energy generation. The junk souvenir merchandise and junk food that clutter our zoos are inconsistent with our message. We should strive to eliminate the market ethos from animal

acquisition, and to shift our activities, and public perception of them, to education as our primary social role.

Rabb, G., 1969 The Unicorn Experiment. Curator 12, 14.

Rand, J., 1986. Anatomy of a Fish Tale: How to Write Better Labels for Your Aquarium or Zoo. Paper presented at the western regional meeting of the American Association of Zoological Parks and Aquariums. Tacoma, WA.

The process of writing exhibit labels is a complex one involving conceptualization; brainstorming; image preparation; setting objectives; prewriting; drafting; reviewing and revising; approvals, and fabrication. Consideration includes visitor attention span, visual capacity, and learning modes which have helped to optimize such factors as label lengths, line counts, character sizes, and colors.

Apart from these procedural and technical details, a label should communicate one idea well in one or two sentences, have a focus (e.g., anticipate and answer a visitor question, explain something the visitor may witness, changes during maturation, locomotion, unusual adaptations, defense strategies, commercial value or special interaction with humans, distinctive traits, explanation of habitat or distribution), and avoid describing features a viewer can see easily unless it is to explain their function.

Monterey Bay Aquarium ID signs are 1-3 sentences, 30 characters per line, 7 line maximum. Focus panels are 5-7 lines, 50 characters per line. It may include a photo caption of 4-5 lines of 45-characters. General panels include 2-3 paragraphs of 5-7 50-character lines. Space permitting, it will include up to 1-3 photo captions of 4-5 45-character lines.

All IDs and focus panels are prominently headed with the species or group name, italicized scientific name beneath. Subheads must be independent clauses aimed at catching the reader's interest, often involving wordplay but never at the sacrifice of meaning. Usage is informal conversational English; voice is active; tone is friendly, direct, conversational, light but not flip, vivid. They aim to impart a feeling, transmit excitement or pleasure. Style emphasizes wordplay, including all the figures of speech (alliteration, assonance, onomatopoeia, parallelism, antithesis, metaphor, simile, polyptoton, puns); often uses the second person to address the visitor.

Reed, T. and A. Mindlin, 1963. Where Do Visitors Come From? International Zoo Yearbook, 3. London: Zoological Society of London.

The purpose of this study was to determine what proportion of visitors to the National Zoo were residents of Washington, of the wider metropolitan area, and of the rest of the country. A random sample of 467 persons were interviewed on four days (one Sunday, one Saturday and two randomly selected weekdays) each month for a year. The survey showed that about 20% of all visitors live in Washington, 30 percent live in the metropolitan area and the remainder come from throughout the US.

Reed, V., 1957. Report and Recommendations on Research Methods Used to Determine the Impact of and Reactions to the US Official Exhibits in International Trade Fairs with Special Emphasis on an Evaluation of the usual Methods as Applied at the Tokyo Fair. Washington, DC: Office of International Trade Fairs, USIA.

Reimann, I., 1957. Post-mortem on a Museum Questionnaire, The Museologist, 63.

Advice on questionnaire construction based on successful and unsuccessful questions in a study at the University of Michigan Exhibit Museum.

Reis, H. (ed), 1983. Naturalistic Approaches to Studying Social Interaction. New Directions for Methodology of Social and Behavioral Science, No. 15. San Francisco: Jossey-Bass,

This collection of articles presents perspectives on naturalistic research methods that do not conform to strict experimental/laboratory conditions, but minimize threats to internal and external validity. They place minimal restrictions on the behavior of subjects, so that freely-chosen, spontaneous acts are the substance of the data obtained. Controls serve primarily to standardize procedures to insure comparisons are possible. Such techniques are particularly suitable for evaluating social interactions but often require considerable time and energy to obtain limited data. A model for studying structured situations and strategies for observing verbal and non-verbal interactions, and utilizing diaries to study social interactions are provided. The research potential of newspaper and magazine surveys and observation of unique events are discussed.

Rejeski, D., December 1979. Do Gorillas Snore? Humane Education.

Questions asked by first, fourth and eighth grade children provide useful indicators of children's interests, psychological needs and cognitive development that should be taken into account in developing science programs.

Reuther, R., 1966. Educational Programme at Cleveland Zoo. International Zoo Yearbook, 6. London: Zoological Society of London.

The Cleveland Board of Education has assigned a qualified science teacher to the zoo to implement an educational program for city schools, which operates from an educational center consisting of a 250-seat auditorium with an audiovisual system, a teacher's office and laboratory, a library, storage facilities. Specific lessons are available for each of the first six grade levels.

Rensenbrink, H. and E. Jacobi, 1966. A Few Remarks on the Educational Work in Zoological Gardens. International Zoo Yearbook, 6. London: Zoological Society of London.

Information about animals in the form of labels and guided tours fails to exploit the educational potential of zoos. A good tour should be of unquestionable quality, last for 60-90 minutes, and avoid superficiality by involving only a small number of animals and have some appropriate theme. School lectures consisting of a 25 minute multimedia lecture and 50 minute walk, can reach larger numbers than guided tours, and can be integrated with the school curriculum. The excursion train or bus in which the driver explains the tour through loudspeakers is useful for reaching large numbers at the most general level, but still reaches only a small proportion of total zoo visitors. Zoos must continue to search for better ways to communicate, and this problem is the most important one facing zoos today. We must direct our educational work in such a way that we are able to convince the mass of the

public of the real importance of animals, of knowing about them and of managing animal life in the wild and in captivity intelligently.

Rhoades, D. and R. Goldsworthy, 1979. The Effects of Zoo Environments on Public Attitudes toward Endangered Wildlife. International Journal of Environmental Studies, 13.

Slides of animals in natural, semi-natural, and zoo settings were rated by college students on a number of semantic differential scales. Results indicate that the settings in which an animal is exhibited affects attitude toward the animal. Zoo animals are seen as significantly less dignified, less happy, less natural, tamer, and more dependent than wild animals. A factor analysis provides further evidence that displaying animals in zoos detracts from their inherent dignity in the eyes of the public.

Exhibits which most closely approximate the natural environment are likely to minimize these perceptions and to improve the perception of the animals. This in turn is likely to improve public understanding of and increase support for the conservation efforts of zoos.

Rhoades, D., 1986. Extinction Education: The Temporal Imperative. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Over the past hundred years, our knowledge of evolutionary events and our understanding of evolutionary principles has grown tremendously. This century of expanding evolutionary awareness has profoundly influenced our intellectual orientation to science, religion, and human social systems. OUr understanding of the biological factors controlling extinction, however, has not dramatically increased during the same time period. It is imperative that zoo educators first make themselves aware of our slowly growing knowledge of extinction mechanics and present that information to the public.

Richardson, C., 1987. Animal Keepers as Educators. Paper presented at the annual western regional meeting of the American Association of Zoological Parks and Aquariums, Fresno, CA.

Keepers Close Up puts visitors in touch with people whom visitors respect as knowledgeable about animals. Using hand-held, battery-powered, portable, microphones--ugly but tough and serviceable--keepers are presenting 10-minute talks in front of selected exhibits covering such topics as *dient and natural habits, telling stories about "their" animals, and answering visitor questions. The program is going well--but it got off to a rocky start. Initially, the Education~Office selected exhibits on the basis of animal popularity and exhibit location, asked for keeper input and approval, then held a kickoff meeting. But, al was not well: most keepers never had heard of the program, many were upset at the idea of additional work, and some had no interest in speaking to an audience, especially with a portable speaker system. The pieces were picked up through one-on-one meetings, and the program limited to volunteers. Schedules were negotiated. A year later, the program is alive and well. It remains voluntary but even non-participating keepers recognize its value. It is very popular with visitors.

Rieger, I., 1986. A Comparison of Zoo Educator's Methods. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

A comparison of the methods used by European zoo educators, based on an analysis of their worksheets, is presented. Only 50% carried the name of the author(s). Less than 40% were dated. The mean length of worksheets was 8.8 pages, with a maximum length of 60 pages. The ratio of information to working pages was approximately 7:3. Four out of 5 worksheets referred to mammals, less than half to birds. More than half of all worksheets referred to animal morphology; nearly one-third to systematics and taxonomy, and 26% to ethology. About 10% were conceived so they could be completed only at a zoo, while 34% could be fully completed without going to a zoo at all.

Rigby, J., 1987. Natural History Family Workshops: The Santa Ana Zoo Experience. Paper presented at the annual western regional meeting of the American Association of Zoological Parks and Aquariums, Fresno, CA.

In 1984 the Santa Ana Zoo began a series of family workshops/fieldtrips focusing on endangered wildlife and habitat destruction. Sites were selected that would support both instructional activities and field work, included "striking" representative flora and fauna, anticipated the interests of the target population, and were within a two-hour drive of the zoo. Intertidal, coniferous forest, and chapparal forest were among the successful selections made. Workshops were limited to 10 te (ucually one parent and one child) and were guided by 3 Santa Ana zoo educators. The workshops provided family-oriented conservation education using wilderness regions as the media and experiential education as the method.

Robinson, E., 1928. The Behavior of the Museum visitor. Washington, DC: American Association of Museums.

Research was conducted at three museums to identify aspects of visitor behavior that might provide a foundation for further work. The questions addressed were (1) are museum guides used by visitors, (2), if not, is the lack of use attributable to antipathy to printed material in general or to the way in which the guides are made available, and (3) can an improved format be designed?

The primary measure was the time visitors spent at exhibits. Data collection was limited to single adults who were classified into one of two groups depending on whether or not they purchased a museum guide. Those who did purchase a guide spent more time at each picture, and viewed more pictures (46, although only 33 were mentioned in the guide) than did those who did not purchase guides.

The concepts of museum fatigue and holding power are discussed, and suggestions for systematizing future research are made that now have primarily historical interest.

Robinson, M., 1987. Towards the Biopark: The Zoo that is Not. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR. Also appears as Beyond the Zoo: The Biopark, Defenders, 62, 6.

In the last hundred years zoos have progressed from animal freak shows to naturalistic displays. Animals are now exhibited in natural social groupings

and multi-species exhibits are common. Exhibit designers have used every artifice of Hollywood to recreate exotic landscapes. Coupled with advances in animal husbandry, the traditional zoo subdivisions among mammals, birds and reptiles are disappearing. But, zoos are still living with unnatural divisions that no longer are philosophically valid: there is really no longer a good reason for separating animals from the rest of the living world. The problem can be expressed very simply: why should collections of living animals be separated from collections of living plants, and why should either of these be separated from collections of the structures composing plants and animals and the fossils of their past history? In short, why should zoos, aquariums, botanic gardens and natural history museums be separate entities?

BioParks could present a unified view of the living world by presenting plants and animals as integral parts of ecosystems. Plants should be presented as important and interesting in their own right and as part of an interactive matrix that is the root of all biological systems. Photosynthesis, pollination, and the coevolution of flowers and insects are of great potential interest. Bringing plants into the picture could strengthen the movement to save endangered species. The conservation of plants certainly is as important to our global ecology as the conservation of animals.

We also need to highlight the interdependency of the aquatic and terrestrial worlds and, beyond that, to steal the techniques of museum exhibtry to link structure and function. The final component needed for the creation of the BioPark is derived from the Natural History Museum. The value to biological education of fossil, skeletal, and anatomical material can be greatly enhanced if it is integrated with living plants and animals. Ideally, these can be selected to illustrate broad principles. What better place, for instance, to illustrate some of the major factors in the life of North American Indians than alongside some of the animals that played such a crucial role in their lives? no buffalo exhibit should ignore the role of the buffalo in the economy, ritual and magic of the plains Indians.

These speculations could spread wider. No exhibit about life can ignore evolution. Currently it is a target of antiscientism. To counteract this the BioPark could simply exhibit without strident comment, some of the major cases of "artificial selection" emphasizing the selections we made that literally made civilization possible, such as those made in the developing agriculture. We can move beyond the present naturalistic style of exhibtry to demonstrate how animals perceive the world. This has the added value of undermining the kind of anthropomorphism that gives people an unreal view of animals. We must show that the view of life in the wild as a life of freedom is a concept relevant to Rousseau but not to biology.

Robinson, P., 1960. An Experimental Study of Exhibit Arrangement and Viewing Method to Determine Their Effect Upon Learning of Factual Material. Los Angeles: University of Southern California (Unpublished doctoral dissertation).

A 3 x 2 ANOVA (N = 216 sixth-grade children) sought to determine the impact if any of three different exhibit arrangements with or without lecture affected immediate recognition and retention of factual material. All groups learned significant amounts of information. Exhibit arrangement had little to contribute as a source of variability either immediately or in retention of factual material. Lecture groups were superior to no-lecture groups in immediate acquisition and retention of material. Total scores showed no significant difference by sex within group. It was concluded that communication was measurably assisted by directing perception of visitors

either through aural reinforcement or active involvement installation techniques to present the content of exhibits.

Rodewald, E., 1985. Multidisciplinary Programming: The Wildlife Discovery Program at the Houston Zoo. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Oklahoma City, OK.

The goal of this program is a quality integrated outdoor learning experience that uses the entire zoo facility. The program was developed by teachers with input from zoo staff. Students must use all five senses to complete questions and projects on activity sheets. Experiential education stresses participation and hands on activities with minimum teacher lecturing. Language arts, spelling, mathematics and art are involved.

Each week, three racially isolated schools send a third grade class to the zoo where they participate in activities for three days. While at the zoo, students work in groups with students from other schools. Each student is given an activity packet that is completed at the zoo and taken home at the end of the week. Followup activities are done on Friday from 9-1 by the Wildlife Discovery Staff. Post-tests show a 30% increase from pre-visit test scores.

Rollin, B., 1981. Animal Rights and Human Morality. Buffalo, NY 14215: Prometheus Books (700 E. Amherst)

The theoretical and practical issues related to animals and morality are dealt with in the context of western intellectual history by a professor of philosophy who teaches a course in ethics at a school of veterinary medicine. Topics considered are moral theory and animals, legal rights of animals, use and abuse of animals in research, and morality and pet animals.

Rosenblatt, P., 1974. Behavior in Public Places: Comparison of Couples Accompanied and Unaccompanied by Children. Journal of Marriage and the Family, 36.

Rosenfeld, S., 1979. Context of Informal Learning in Zoos. Roundtable Reports, 4, 2.

Zoos concentrate their educational efforts on school visitors and classes. Rosenfeld addresses possible ways to improve informal education aimed at casual visitors, who number over 130 million per year in the U.S. One way, termed the "design approach," is to develop learning aids for the casual visitor: signs, tapes, booklets, activities and the like. Such work usually begins with an analysis of goals, followed by activity design, evaluation and revision. An alternative, the "naturalistic approach," is to investigate "what is actually happening" with zoo visitors. The emphasis here is on how zoo goers direct and organize their own experience, on discovering and understanding the factors that relate to informal learning from their perspective, on determining what they considered to be the criteria for a successful visit, on how they define learning and on what is important to them.

The first approach dominates but both are needed. Rosenfeld took the second approach at the San Francisco Zoo, first interviewing 32 groups (ninety people) about their motivations, expectations and what they enjoyed, disliked and thought they had learned. Then he followed nine randomly selected family groups, noting what exhibits each group visited and for how long, and what

else they did during their visit. These people were interviewed as they left the zoo.

Among other results Rosenfeld reports visits ranged from 45 to 142 minutes, that 5 to 64% of time was spent looking at animals, that from 5 to 52 exhibits were visited, but time spent per exhibit was from 70 to 90 seconds. People spent the most time at exhibits where animals interacted with each other or with visitors. They often tried to attract and interact with animals (often ignoring no-feeding rules), including squirrels and pigeons free in the zoo area.

Rosenfeld deduced interaction as the common denominator and designed six "Zoo Games:" (1) How far can you jump, which could be compared with photos of various animals, with guided activities to help understand the physics of jumping. (2) How tall are you, which could be compared with heights of various animals. (3) How fast can you run--same idea. (4) How fast does your heart beat--same idea, using a plastic stethoscope. (5) Sunflower seed eating--shelling and eating five without hands, compared to a macaw. (6) Animal detective game, in which visitors tried to find animals having specific adaptations for moving, eating, grasping, hearing, in a tic-tac-toe format. There are countless ways to provide interactions at a zoo, although the author takes the position that animal kiddie rides and circus rides should be avoided as they create or reinforce myths and negative attitudes toward animals.

Rosenfeld, S. and A. Terkel, 1982. A Naturalistic Study of Visitors at an Interactive Mini-Zoo. Curator, 25, 3.

To investigate how zoos might enhance informal learning, a mini-zoo of six animal exhibits (some handleable) and seven zoo games was established for five weeks. The games included How far can you jump, How tall are you, How fast can you run, How fast does your heart beat (all compared with various animals), Sunflower seed eating contest (shell and eat five sunflower seeds as fast as a macaw without using hands), Animal detective game (find animals with specific adaptations) and Draw an animal.

Twenty-three visitor groups were observed and 16 visitor groups interviewed. Although the observer sometimes was detected, it is claimed, without evidence, that visitor behavior was not influenced. Sequence of exhibits visited, levels of interaction time spent at each exhibit, total time at the mini-zoo, which group member initiated movement among exhibits and verbal comments were recorded. Interviews used sentence fill-ins, open-ended questions and projective techniques based on pictures of people talking about their experience. The latter were the most successful at detecting any negative feelings.

The mini-zoo visits were found to be overwhelmingly child-oriented, the children speaking of their reasons for being there and the adults explaining their presence in terms of their children. Children interacted far more frequently and longer than adults with both animals and the games, and controlled the pattern and pace of the visit in 69% of the groups.

Three different orientation styles were observed. "Casing out" was done by one member who quickly walked around then returned to the group and acted as guide. "Wandering" was the most frequent strategy, particularly in groups where young children led. "Specific focus" was seen in a few groups which came to see particular animals, usually reptiles.

Holding power graphed against attractiveness made it apparent that the animals attracted more people but the zoo games held people for a longer time.

The animal exhibits produced more comments (508) than the zoo games (287); fewer were concerned with group management (32.8% vs. 49.8%). More

were concerned with the exhibits (44.8% vs. 13.2%) and those at the animal exhibits dealt with emotion, naming the animal, attributes, behavior, imitating or talking to the animal, petting and fear of being bitten. Less were concerned with interpretive comments at the animal exhibits than at the zoo games (11.4% vs. 29.9%), and social comments were about evenly divided (10% vs 6.9%) between exhibit types. From this it is concluded that animal and zoo game exhibits complement one another in attractiveness, holding power and ability to engender conversation. This is consistent with a growing body of research showing a preference for multisensory exhibits as opposed to static, nonparticipatory exhibits.

One major obstacle to the effective use of the games was the time and energy visitors required to understand instructions. Three possible solutions are simplified graphics, trained docents, and micro-computers.

Several aspects of the methodology may be applied to other naturalistic studies, including graphing attractiveness vs. holding power, recording then classifying spontaneous comments of visitors and projective techniques. Such information is potentially useful to zoo managers and zoo educators in adapting what they see as appropriate educational goals to the social context of the family visit to the zoo.

Ross, J., 1981. The Insect World at the Cincinnati Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

Generally, invertebrates have been sadly neglected as zoo exhibits. A few hardy specimens such as tarantulas and scorpions may be kept but generally are poorly exhibited. Lack of popularity, the potential threat to agriculture, the small size of most insects, and a satisfactory labeling system make them difficult to keep in zoos.

Rost, A. 1984. Every Zoo Can Have One - The Zoo Library. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Springfield, MO.

Few zoos devote appropriate resources to developing and maintaining a suitable library. If a library exists, it often is an extra duty assigned to the education curator. The NZP librarian keeps current information on zoological libraries in North America. Library news for Zoos and Aquariums is published three times a year to assist new and existing zoological libraries with problems and to provide ideas for programs and design. Material suitable for even the smallest zoos is recommended.

Rossett, A. and S. Smith, 1981. Structured Approaches to Instructional Problems. San Diego: San Diego State University.

An approach to instructional systems design based on the five steps of analysis, design, development, implementation and evaluation.

Rost, A., 1985. Information Management as a Critical Function in a Total Zoological Management Program. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums.

Historically, the management of information in zoological institutions has existed in only fairly fundamental forms, such as verbal or written reports from keeper to supervisor, or the publication of zoo newsletters or

guidebooks. Few institutions maintained a library of any consequence or held an animal records system of any real depth.

Harold Borko defines information science as "The study of the properties and behavior of information, the forces governing the flow of information, and the means of processing it for optimum accessibility and usability." At a time when society is moving from the specialist who is soon obsolete to the generalist who can adapt, the information specialist in the smaller zoo may well represent one of the inevitable creations of the information society. To survive, the zoological institution will have to be information wise if it is to exist in an an information society.

Sanders, G., 1974. A Study of Stated Concerns of Secondary School Students on Selected Animal Welfare Problems. Tulsa: University of Tulsa (Unpublished doctoral dissertation).

A 31-item questionnaire was administered to 150 eighth, 150 tenth and 150 twelfth grade students. Eighth grade students exhibited the greatest degree of stated concern for animals, as did females, suburban students, and those who owned pets.

Santa Fe Community College, 1984. Catalog. Gainesville, FL: Author.

Santa Fe Community College offers an AA degree in Biological Parks Technology. The program is aimed at those interested in employment in zoos and parks and includes practical instruction and clinical experience on an 8 acre zoo on campus. Students must complete general education requirements in English,public speaking, math, vertebrate zoology, chemistry, psychology and social sciences.

Professional courses address historical, organizational and physical aspects of zoological parks, crowd control, staff interaction with the public, emergency procedures including first aid and firefighting, exhibit principles, public relations, and preparation and presentation of educational programs. Animal management courses include sanitation, habitat and general maintenance, data collection and record keeping, nutrition and breeding both in general and for specific groups (herpeculture, aviculture, mammal culture, aquarium culture).

Schassburger, R., 1980. The Seasonal Display of Plants and Animals as a New Form of Exhibit. Proceedings of the Third International Symposium on Zoo Design and Construction. Paignton, ENGLAND

Zoos must concentrate more and more on demonstrating basic concepts of nature, one of which is seasonality. The major factors of photoperiod, temperature and moisture have already been controlled independently in zoos, so it is possible to envision an environmentally controlled building with four exhibit areas identical in every way except the season represented, rotating them so as to give the animals a full year too, and controlled by computer.

Schiotz, A. and G. Vestergaard-Hansen, 1981. New Signs in an Old Aquarium. International Zoo Yearbook, 21. London: Zoological Society of London.

The development of an aquarium sign system readable in darkened rooms, without disturbing reflections from the aquaria, with high durability, that would be easily cleaned, easily removed by staff but not by visitors, and inexpensive is described. Content was determined and given relevance for visitors largely by addressing the question of why the particular species was exhibited.

Schlegel, D., 1982. Educating the General Zoo Visitor. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Phoenix, AZ.

Schlegel discusses various strategies for educating visitors. The National Zoological Park [NZP] uses information booths, bulletin boards and a mobile information cart. Arizona Sonora Desert Museum [ASDM] and the Philadelphia Zoo place volunteers at specific exhibits. Some zoos use shows,

slides and films. NZP has show films on zoo operation, research and breeding efforts. A..M has a "meet a snake" program. Sea World has demonstrations of its training methods and has found them profitable. Sesame Place uses computers and San Francisco Zoo makes use of silhouettes.

Schroeder, B., C. DuPre and C. Melancon, 1985. The Mountain to Mohammed: The Good and Bad of Mobile Units. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Birmingham, AL.

The authors deal with the requirements for a good zoomobile unit. The vehicle needs to be water-tight, equipped with mesh shelving and cabinets secured by straps. It should be equipped with a projector, portable microphone, an easel, an cleanup materials including whisk broom and dustpan, plastic sheeting, trash sacks, and paper towels. Basic first aid materials, water dishes, and such foods as peanuts and sunflower seeds should be carried. The vehicle should have a dolly that can convert to a push/pull buggy.

Policies include basis for charges, operating range, allowance for set up and take down time, and presentation time, target audience. In general, a zoomobile presentation includes a slide show, objects and some small live animals. Topics include zoo etiquette, favorite zoo animals, vertebrate characteristics, endangered species and careers working with animals.

Potential problems include failure of docents to realize maintenance requirements and responsibilities, marketing, audience expectation for entertainment rather than education and exploitation of and stress on animals.

Screven, C., 1970. The Application of Programmed Learning and Teaching Systems Procedures for Instructions in a Museum Environment. Washington, DC: US Department of Health, Education and Welfare (unpublished final report, Project 7-0138). Reprinted in Borhegyi, S. and I. Hanson, 1968. The Museum Visitor. Milwaukee: Milwaukee Public Museum.

The goal of the project is to adapt the basic features of programmed instruction and reinforcement theory to the improvement of instructional efficiency of museum exhibits. Even well-planned exhibits communicate only a small portion of their information to visitors, partly because of the limitations "built in" to the conventional relationship between visitors and displays, including (1) simultaneous display of the same exhibit to an audience of varying interest and background; (2) a voluntary audience not subject to the kind of controls imposed in classrooms; (3) a fixed display that has poor attention holding power; (4) inability to control the order in which the visitor takes in the elements of the display; (5) little provision for active involvement and (6) little or no concrete motivation to master the ideas and knowledge contained in any display.

Research currently is being conducted at the Milwaukee Public Museum to develop and test procedures for obtaining continuing measures of pre-and post-exhibit knowledge of the visitor, securing active involvement with exhibit concepts, controlling the order in which the visitor attends to particular display elements, adapting a fixed display to varied visitors and selectively rewarding visitor performance. The major device is a "self-teaching machine" carried by visitors and including multiple-choice answer cards in which answers are indicated by punching holes with a stylus. Correct responses are rewarded with a row of neo lights on the device. Five variations of the material including a control currently are being tested.

Screven, C., 1976. Exhibit Evaluation--A Goal-Referenced Approach. Curator, 19, 4.

The educational goal of museums is not to impart just facts, but also broad overviews, concepts, stimulation of interest and values, new ways of thinking. Few visitors have the perceptual skills to relate the objects on display to meaningful concepts, processes, or events. The typical museum audience varies widely in interests and backgrounds, has limited time, is often physically exhausted and is frequently confused by too much input. Meaning often depends on the order in which exhibits are seen, but visitor movement is difficult to direct. Despite this, it is assumed that museums probably can communicate seriously. At least three important questions must be answered in evaluating educational impact of exhibits. What impact do you want? How will your exhibit achieve the desired impact? How will you know if exhibits have had the desired impact on the intended audience?

Answers to these questions depend on specification of goals in measurable learning or performance outcomes and on exhibit evaluation. Evaluation is the systematic assessment of the value of a display, exhibit, gallery, film, brochure or tour with respect to intended goals for the purpose of making decisions (continue it, redo it, stop it, throw it out, avoid it in the future). It is useful to distinguish between formative and summative evaluation. Adapting to museum applications, formative evaluation takes place during planning and constructing an exhibit, or modifying one, and the results are used to change and improve elements to achieve intended goals. Summative evaluation provides the basis for deciding whether or not the exhibit, or its design features, should be continued, repeated, or removed. Ideally, formative evaluations use low-cost temporary or mock ups of exhibits and are part of the planning and installation of all exhibits from the beginning. Summative evaluation uses actual exhibits. The steps for conducting each are spelled out in the remainder of the article.

Screven, C., 1974. The Measurement and Facilitation of Learning in the Museum Environment: An Experimental Analysis. Washington, D. C.: Smithsonian Institution Press.

Museums provide an alternative learning environment that can take advantage of advances in instructional design and communications technology. The typical museum audience is heterogeneous in age, background, interests, and reasons for visiting a museum. It is voluntary and unlikely to devote time and effort to learning. Visitors always are free to ignore the museum's efforts to teach by moving on.

Therefore, devices that did not appear primarily as tests were used to assess the educational impact of selected exhibits. One involved portable punchboard question-answer device on which the visitor could respond to leading questions and obtain immediate feedback. Another used machines that included buttons and gadgets to attract the interest and cooperation of visitors.

Screven, C., 1977. Some Thoughts on Evaluation. In Program Planning Committee, The Visitor and the Museum, Berkeley: Lowie Museum of Anthropology, University of California.

Evaluation is carried out to make practical decisions regarding an exhibit or program. At least three questions are involved: what impact is desired, how will the exhibit achieve the impact and how will you know if you

have had the desired impact on the intended audience. Evaluation is a technical and involved affair, but it also is controversial because it requires specifying exactly what goals are desired. Possibilities include entertainment, new information, reinforcing or extending previous knowledge, stimulating new interests, or developing positive attitudes to something. Failure to specify goals makes development of a meaningful evaluation difficult.

Screven, C., 1979. Visitor Attention and Learning in Public Exhibits and the Role of Evaluation. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, St. Louis, MO.

Most zoo visitors are tourists, families or socially oriented groups with little preparation for understanding what they see and read. Even avid zoo goers were unaware of the more subtle but important dimensions of the behaviors of specific animals which they saw so often. Worse yet, they exhibited fundamental misconceptions about the animals and the optimal conditions for caring for animals in captivity, how species differ from one another and so on. Under these conditions, four things can be done to produce exhibits that facilitate communication: (1) Decide the most important things you want the exhibit to say to the people you expect to look at it; (2) Find out the needs, skills, misconceptions, interests, and other characteristics of your target audience; (3) Determine exactly how you are going to tell whether any exhibit produces the desired effect; and (4) involve some of your intended audience in as partners in exhibit planning.

Behavioral measures such as attracting and holding power often are equated with a successful exhibit, but are only prerequisites to learning. To find out if an exhibit is communicating intended ideas, learning outcomes must be defined and measured directly using an appropriate research design. To measure potential communication "cued" visitors are appropriate. To measure actual communication, "uncued" visitors are appropriate.

One of the difficulties with interpretive labeling is that most are written by experts and judged by peers with little attention to display objectives or the intended audience. Some characteristics of labels that attract, hold and communicate to voluntary passing visitors are (1) directing attention to visual or other concrete aspects of the exhibits such as movement, color, smell, differences, similarities; (2) involvement of the viewer by asking questions, directing viewers where to look, encouraging viewers to take actions such as comparing, looking for similarities or developing generalizations.

Screven, C. and R. Lakota, 1970. An Experimental Study of Learning in a Museum Environment. Paper presented at the meeting of the American Psychological Association, Miami, FL.

Seal, M., B. Rongren, and D. Cote, 1981. A Money Stretcher: Use of Volunteers at Minnesota Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

Volunteerism is an extraordinary phenomenon in the United States, involving untold hours assisting service organizations such as scouts, charities, hospitals, schools, disaster relief, libraries and museums, among others. Since the early 1960s, an increasing number of zoos have successfully used this workforce. Volunteers can stretch zoo money by providing free many zoo services, but must be trained for their role, which is best done in a

formal class from which they must graduate before serving. Such programs are not without their problems, which are of three general types: volunteer/public, volunteer/volunteer and volunteer/staff. But these can be worked out to the overall advantage of all.

Segal, J., n.d., Animal Show Survey Results. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums.

Ninety of 107 zoos (84%) returned a questionnaire inquiring about animal shows at their facilities. Of the respondents, 72 have animal shows, 28 of which were initiated after 1980, and 5 more plan to add shows in the near future. In-house (65), outreach (35) and both (43) types are offered. Only 11 involve an added fee. Domestic animals, sharks and fish, ponies and horses, chimps, llamas, camels, reptiles, marine mammals, birds of prey, birds, elephants and small "handleable" animals were mentioned as participants. Sixty-seven zoos indicated that shows involved an educational message, 32 felt shows were positively correlated with increased attendance (16 not sure, 20 no), and 17 reported negative comments from staff, audience or humane society organizations.

The general tenor of comments by respondents--primarily zoo directors--might be considered as generally favorable <u>if</u> circus tricks are avoided, and natural behaviors and education are the purposes. But, many also uncomfortable with the inherent contradiction of what is done in the shows and what often is said about the inappropriateness of exotic pets, or of the fundamental conservation purposes of zoos. And, as twelve respondents put it, broadly, the entire zoo or aquarium is itself one big captive animal show.

Although 89% of responding institutions give or plan to give animal shows, the word itself evokes tremendous negative emotional response: almost half the respondents mutilated the word in some way, often replacing it with words like "seminars" or "animal talks." Another word that many got entangled with was "dignity." Respondents wanted to preserve it or avoid compromising it. A third was "education." Respondents probably are not as grim in practice about avoiding the entertainment tools of the teacher's trade as they were in responding to the survey. Nor is it likely that using the word justifies everything we do. Taken together, the three reveal a militant attitude toward entertainment and against entertainment. Yet, follow-up calls suggest that there have ben <u>no</u> efforts to evaluate programs in terms of predetermined goals.

Sellers, J., 1987. Docent Dropout. Paper presented at the annual meeting of the Association of Zoo and Aquarium Docents, Pasadena, CA.

Managers of volunteers have access to an impressive array of literature to facilitate the design, implementation, and evaluation of training programs, volunteer personnel management, and motivation strategies. Attrition reduces the effectiveness of docent programs and leads to strategies for retention including job enrichment, goal commitment, minimal criticism, showing appreciation of efforts, providing opportunities for creativity, due process over grievances, an open climate for free communication with superiors, training when assigned unfamiliar tasks, sensitivity to the anxiety engendered by evaluation, and provision of a career ladder for some volunteers.

For the most part, dropping out is a process that occurs over time due to an accumulation of factors, rather than a single event. Dropping out stems from two general factors--level of satisfaction and intent to leave. At least 25 factors appear related to level of satisfaction, and 5 of these can lead to

an intent to leave even if satisfaction itself is high. The latter 5 include economic conditions, personal transitions, family responsibilities, significant others and opportunity to leave. The remaining 20 include previous volunteer experience, educational background, employment status, recognition, practical value, personal development, routinization, instrumental communication, participation in decisions, social integration, academic integration, orientation, training, physical demands, evaluation, cost of participation, equity, organizational status, institutional quality, and commitment.

This catalog provides a model that can be assessed using multivariate path analysis, and its usefulness judged by its capacity to accommodate existing research, inform and provide a reasonable organization to this research, and ultimately, to improve practice.

Serpell, J., 1981. Childhood Pets and their Influence on Adults' Attitudes. Psychological Reports 49.

A survey of 120 adults was conducted to investigate the influence of childhood experience with pets on adult attitudes toward pets. Results suggest a significant association between childhood contact and a tendency to keep pets as an adult.

Serrell, B., 1981. Zoo Label Study at Brookfield Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

The purpose of the study was to gain insight into what is attractive to zoo label readers, what kinds of content seem to hold their attention, and who the readers are. Over 1500 zoo visitors comprised the randomly selected sample. Visitors were observed at thirteen different exhibits under two different label conditions--old and new. Old and new labels were produced in the same format but the new labels were written to (1) stimulate visitor attention to the exhibit, (2) hold their attention long enough to finish reading the entire label, and (3) promote behavior which would suggest involvement with the exhibit, such as talking, pointing, reading out loud and spending more time at each display. The new signs increased readership to 50% of visitors from 31% for the old signs.

Serrell, B., 1980. Looking at Zoo and Aquarium Visitors. Museum News, 59, 3.

Three studies involving audience analysis, behavioral analysis and evaluating effectiveness of a specific educational technique, are reported. The first used sampled both the general population (3000 interviews nation wide) and zoo visitors. It was found that those zoo-goers were characterized as having a strong affection for wildlife, rather than specific intellectual curiosity. But, they tended to have higher scores for knowledge of animals in comparison to the general population.

The second study sought to determine through unobtrusive observation what visitors actually did while at an aquarium. Data showed that visitors spent more time at larger tanks and with exotic species (sharks, lionfish, seals, octopuses) than at tanks with less exotic species.

The third study concentrated on social interactions among groups of zoo visitors. Visitors were found to share their experiences through physical and verbal exchanges within their own group, rarely interacting with strangers. Groups moved loosely with children taking the lead and adults playing rear guard. rhetorical.

Serrell, B., 1982. Making Exhibit Labels: A Step-by-Step Guide. Nashville, TN: American Association for State and Local History.

The objectives of this handbook are (1) to establish the necessary priority of labels and their importance as integral parts of exhibits, (2) to elicit the support necessary for the creation of good labels, (3) to describe the best processes for making labels, (4) to establish testable criteria for the effectiveness of labels, (5) to encourage brevity, clarity, simplicity, and legibility, (6) to discourage counterproductive practices and (7) to reward good examples and promote better ones.

Serrell, B., 1978. Visitor Observation Studies at Museums, Zoos and Aquariums. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Denver, CO.

Data gathered on visitors most often consists of amount of time spent at an exhibit, whether or not visitors read signs, group interactions and traffic patterns. Characteristics such as age, sex and group size usually are recorded also. Such studies provide baseline and planning data and often have applicability to other institutions.

Serrell, B., 1979. Zoo Labels: An Evaluation Study at the Brookfield Zoo. Chicago: Brookfield Zoo.

Sheng, S., 1987. An Opportunistic Approach to Conservation. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

Conservation involves planned management of natural resources to prevent exploitation, destruction or neglect. As a fish biologist, this means habitat protection, watershed management, and setting and enforcing fisheries quotas. It is possible to conserve and still to eat fish. This contradicts the usual image of conservation, which usually centers on some endangered species or vanishing habitat with a strong sense of urgency and some symbol--the condor or snow leopard--to rally support. As few aquatic animals appeal as symbols, it is imperative for us to take advantage of the opportunities that come our way to overcome resource and public perception hurdles to conservation.

Puget Sound plays a significant role in the economy, transportation, trade, recreation, and fisheries of the region. The heterogeneity of the user population led a multitude of agencies, and high population density assures a large number of people with personal experience of it. Agencies had money and people had interest.

From this situation, and the known problems of the Sound, we developed "Adopt-a-Beach" to stress the positive impact individuals could have. Interactive exhibits captured the interest of Aquarium visitors and became the foundation for education programs, generated human interest stories, captured press attention, and broadened our message to the entire region.

To play the roles of advocate, planner, catalyst, laborer, and conservationist we have to understand public and political sentiments, build alliances, use the power of the press, and look for and sometimes create opportunities for conservation.

Sheng, S., 1986. Remarks as a panel member on "Research in Zoos and Aquariums: Its Practical Value." American Association of Zoological Parks and Aquariums. Tacoma, WA.

From the viewpoint of the director of an aquarium, the potential benefits of the Consortium of Aquariums, Universities, and Zoos include staff development and motivation; useful, specialized skills which are beyond the resources of all but the largest institutions, and enhancement of research and funding. These more than offset the costs, most important of which are provision of space, finding the time to work with another institution and any change in routines necessary to encompass the expanded activities.

Shields, M., December 1985. Educating the Public with Small Mammals. Animal Keepers Forum.

The keepers of the Small Mammal House at National Zoological Park attempts to enlighten the public about the role of small mammals and the need for conservation through informal classes using live animals, pictures and animal artifacts. Some of the animals have been hand-reared, some have not. Hand-rearing was chosen not for the program but because the animal had been abandoned or for reasons of health. Individual animals are used no more than three times a week. Touching of animals is not permitted. Animals used include a fennec fox, house shrew, spiny mouse, tenrec, chinchilla, hairy-footed hamster and three-banded armadillo. The content is taxonomic and ecological. Advantages of the program include keeper interaction with the public and educational value.

Shettel, H., 1973. Exhibits: Art Form or Educational Medium. Museum News 52, 1.

Museum exhibits can be intrinsically interesting, aesthetically appealing, educational, or any combination of these. The primary value of the museum experience lies in the opportunities it makes available for visitors to increase their knowledge or to change their beliefs and attitudes toward a wide variety of subjects, many not otherwise likely to be encountered. Thus, exhibits should be designed to communicate intelligently and intelligibly.

A mock exhibit was built to test variations in design before final installation, and to determine if such mockups are useful in evaluating exhibit designs while changes still are possible. Signs were significantly more effective than a taped voice of the same text. No difference was found between skeleton and full texts or between having or not having visuals. A $200 slide projector was as effective a teaching device as a $3000 video tape deck. Effectiveness appears to depend more on appropriate use of technology and quality of the software than the hardware itself.

Some recommendations were that 1) teaching exhibits must have explicitly stated objectives, 2) content must be appropriate for the targeted audience, 3) order of presentation must be taken into account as it is a major factor in learning, 4) acquisition, reinforcement and retention is enhanced by visitor participation and 5) revision and testing of materials is essential.

Shettel, H., 1976. An Evaluation of Visitor Response to "Man in His Environment. Washington, D. C.: American Institutes for Research in the Behavioral Sciences. ED 141 078.

This study was conducted to evaluate an exhibit at the Field Museum of Natural History in Chicago, designed to impart the following points to a broad cross-section of the population:

1) As a result of the limited resources of the earth, nature has evolved systems to keep populations under control.

2) Man is an active participant in natural systems and that he has the capacity to modify them.

Approximately 150 volunteers were pre-tested using a 17 item questionnaire and post-tested using a 27 item questionnaire and interview to measure attitudes. Also, 15 randomly selected visitors were observed unobtrusively to determine which exhibits they stopped at, for how long and how they reacted. Findings were:

1) Visitors were primarily young white male and female adults, primarily from suburban Chicago or from out of town.

2) Visitors possessed most of the knowledge and attitudes that the exhibit intended to impart on arrival.

3) College educated visitors knew more before viewing the exhibit than did high school educated visitors after viewing the it.

4) The exhibit was instructional, especially to the participants who had completed high school.

Shettel, H., 1966. An Evaluation Model for Measuring the Impact of Overseas Exhibits. Technical Report No. AIR-F28-6/66-FR, Contract No. NY-66-354. Washington, DC: US Atomic Energy Commission.

Methodological problems involved in measuring visitor reactions to exhibits, emphasizing the difficulty of determining attitude change under short exposure to exhibits.

Shettel-Neuber, J., 1985. Bird and Primate Mesa: Post-Occupancy Evaluation and Comparison with Older Exhibits. San Diego: Zoological Society (unpublished).

This study was conducted to evaluate a group of new exhibits from the standpoint of their effect on visitor attitudes and behaviors, staff attitudes and animal behavior and to compare visitor, staff and animal responses to naturalistic "third-generation" exhibits versus older, "second-generation" exhibits housing the same species. The amount of time visitors spent at the exhibits, the number of visitors per exhibit per day, visitor abuse (feeding, giving animals objects and derogatory comments), visitors attitudes toward the exhibits and animals, staff evaluations of the functional aspects of the exhibits, and staff assessments of the differential effects of the exhibits on the animals were the topics addressed. Behavior mapping (systematically recording behavioral activities which occur during a random sample of times to determine the relative occurrence of the behaviors in the environment), timing, tracking, questionnaires and interviews were used to collect data between February and June 1983. The presence and activity level of the animals were recorded in behavior mapping, and correlated with number of visitors present. This correlation was significant in six cases out of eight. Time spent at exhibits was significantly different at 20 of 55 possible pairs. Tracking data revealed no decrements in time spent visiting successive

exhibits in the area where observations were conducted. Only 19 of 433 visitors read signs, most often when the animals themselves were not visible.

Shulov, A., 1975. Proposed Children's Biblical Zoo at Jerusalem. Proceedings of the First International Symposium on Zoo Design and Construction, Paignton, ENGLAND

The children's zoo being planned for Jerusalem will exhibit typical animals from all parts of the world but will stress those mentioned in the bible, and will be exhibited in conjunction with biblical verses in a setting emphasizing plants that also are mentioned, again with relevant verses.

Smith, L., 1981. Educational Graphics in the National Zoological Garden of South Africa, Pretoria. International Zoo Yearbook, 21. London: Zoological Society of London.

Species identification labels consist of line drawings which serve to identify the animal and to provide some indication of the natural habitat, a distribution map and the vernacular name. The system of educational graphics takes account of the formal educational program of South African schools and includes several categories of information, including taxonomic, biologic (size, gestation, litter size, longevity), food and habitat. All signs integrate illustrations and text in both Afrikans and English in systematic fashion.

Smits, E., 1964. A Suburban Museum Looks at Its Visitors. Museum News, 42, 9.

Museum visitors were surveyed to determine sex, age, and other demographic data, and to determine purposes behind their visits. Visitors were 44% male, 56% female, for both children and adults. 87.5% reported their visits were primarily for educational purposes.

Smyth, J. 1984. Environmental Education and the International Union for the Conservation of Nature and Natural Resources. A paper presented at the International Association of Zoo Educators, Edinburgh, Scotland.

Environmental education requires development of materials to achieve specific goals and of long term strategies to provide young people with the concepts, skills and attitudes needed for wiser behavior towards their natural environment. Zoos have a major role in environmental education and a special obligation to provide visitors with an understanding of the environmental problems of faraway places and unfamiliar plants and animals.

Sommer, R, 1972. What Do We Learn at the Zoo? Natural History, 81,7.

Sommer argues that zoos may often miseducate the public about animal behavior. Examples include sexual aberrations, aggression and "blah-ness" stemming from confinement. He believes it is necessary to determine exactly what people do learn at zoos, then to decide what aspects of the zoo should be overhauled, strengthened, or eliminated. Sommer believes that research on visitor responses would improve the ability of zoos to achieve their "expressed educational objectives".

Spencer, R., 1976. Construction and Validation of an Instrument Designed to Measure Cognitive Achievement in Humane Education Among Second and Third Grade Pupils. Tulsa: University of Tulsa (Unpublished doctoral dissertation).

Describes construction of an instrument for assessing cognitive learning in humane education among second and third grade students. Major procedures included the pilot tests; refinement and administration of the final instrument; and analysis of data. The resulting tests include Wildlife in our Community, Pets, Farm Animals and Animals of the Forest.

Srivastava, R. and T. Peel. 1968. Human Movement as a Function of Color Stimulation. Topeka, KS: The Environmental Research Foundation.

Steele, P., 1986. Beyond the Gates--Challenges and Opportunities for Zoo Education. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Zoo educators are in an enviable position to influence the views and opinions, and increase the general level of environmental awareness, among the millions of people who visit zoos every year. As well as exploring the diverse threads and elements of conservation issues with their own 'captive' audiences there also is great scope for the development or encouragement of links with groups and activities outside the immediate environs of the zoo--particularly in developing countries. The World Conservation Strategy can provide a useful platform for zoo educators to play an increasingly important role in promoting and supporting conservation education activities worldwide.

Steele, P. 1984. Supporting Conservation Education in Developing Countries. The International Centre for Conservation Education. A paper presented at the International Association of Zoo Educators, Edinburgh, Scotland.

A project to promote and support practical conservation education programs in developing countries, particularly among young people includes audio-visual presentations used by existing organizations in underdeveloped countries. A bi-annual newsletter encourages more efficient and useful communication of ideas and sharing of resources among countries with similar programs and circumstances.

Stinson, J. 1984. The Keeper as an Educational Resource. Paper presented at the annual meeting of American Association of Zoological Parks and Aquariums, Phoenix, AZ.

One purpose of the American Association of Zoo Keepers [AAZK] is promotion of keeper education. AAZK disseminates information to assist in transportation and care of animals, reviews books of professional interest, collects information on zoo education programs, keeps members informed on legislation and conservation issues, and awards $250 grants to support keeper research. AAZK encourages keepers to take a role in educating the public. In a five-year old program at the Phoenix Zoo, keepers serve as guides for 2 hour tours that includes a slide presentation and a question and answer session. Weekend tours for adults and after school program for 6-16 year olds also were offered. A course to prepare keepers for the tours is offered by a community college.

Stieg, D. 1984. A Review of US Zoomobiles and a Proposed One. Paper presented at the annual meeting of American Association of Zoological Parks and Aquariums, Omaha, Nebraska.

A survey of 26 US zoos identified zoomobiles as a way zoos seek to extend the public reach of zoos. Vehicles usually consist of vans. Staffing rests primarily on volunteers. Zoomobiles serve nursing homes, hospitals and schools. They serve 5000-6000 per year on average. About half operate during the school months only. The maximum distance and time traveled is about 100 miles or about 2 hours. Half provide free programs, half charge for programs. The basis varies, sometimes based on distance, sometimes number of groups and sometimes attendance. Zoomobiles do not pay for themselves, so must be financed by private sponsors, zoo associations and governing institutions. The typical program lasts 45 minutes to an hour. Animals were not tamed or trained specifically for the zoomobiles; often non-releasable rehabilitants are used. Liability and automobile insurance generally is carried. Demand for zoomobile programs is high in communities having them.

Stringer, B., 1985. It's a Jungle Out There: The Need to Plan and Evaluate in Order to Survive. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Cleveland, OH.

There are many planning techniques and procedures but any planning strategy will share certain basic steps. They are: gather data, identify the problem or opportunity, examine the experience of others, consider the future, evaluate alternatives, select the best, weight the positive and negative factors, implement a plan, monitor that plan and finally evaluate results.

Surinova, M., 1972. An Analysis of the Popularity of Animals. International Zoo Yearbook, 11. London: Zoological Society of London.

This study asked 4123 Czechoslovakian children by way of television programs and magazines which animals they liked most and least. The ten most popular were the monkey, dog, parrot, bear, chimpanzee, doe, horse, cat, stag and lion. The ten least liked were snake, rat, wolf, lion, mouse, polecat, fox, frog, tiger and crocodile. Results were similar to those of two previous studies, one done in Czechoslovakia and one in Britain.

Swanagan, J. 1982. Expanding Your Education Programs through Volunteers. Paper presented at the Great Lakes Regional Conference of the American Association of Zoological Parks and Aquariums, Columbus, Ohio.

To maximize public support of zoo goals, zoos must appeal to the widest possible audience by pursuing all of the four traditional goals (education, conservation, recreation and research). Careful utilization of volunteers will permit operating overlooked programs which have not been previously cost-effective or appealed to small audiences. Docents, teachers, college students and parents are valuable both as volunteers and as recruiters of volunteers.

Swensen, S., 1984. A Comparison of Visitors at Different Types of Zoo Facilities. Unpublished.

Swift, J, 1985. The Establishment and Development of Research programs at Smaller Zoos. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Birmingham, AL.

Three major factors that positively influence the development of a research program on a modest budget are starting with a small program, unconditional administrative support and encouraging the active participation of keepers and curators. A primary function of the research program at one zoo may be to provide the animal staff with daily information about the behavior and activity of selected species; another may focus on a major project of less relevance to daily operations but have longer-range or theoretical value. Three primary components are necessary: selecting an appropriate person to supervise the department, organizing a network of local researchers in an advisory capacity, and recruiting a corps of dedicated volunteers. Smaller institutions can have a successful research program if they adopt a cooperative approach that involves the animal and administrative staff, volunteers and local researchers.

Taylor, L. 1981. Gorilla, Gorilla, Gorilla, Gorraphics. Paper presented at annual meeting of American Association of Zoological Parks and Aquariums, New Orleans, LA.

Graphics designed to make exhibit signs information as well as appealing, but not overwhelming, were tested in conjunction with the opening in 1980 of a new gorilla exhibit at San Francisco Zoo. Humor, language variation, position of the signs, context, continuity and mood all were considered in devising the new signs. 15,787 individuals (2% of annual attendance) were observed at the exhibit during the next year.

72% of the 2000 people observed at this point stopped to look at or read the "entry graphic" to the exhibit, which was designed to calm children down before their arrival at the first viewing station. 27% were observed to be reading aloud or gesturing about the sign. The All in the Family graphic probably appeals mainly to families. The average visitor spent 78 seconds here. Of the 291 families observed, 83% spent 2 to 5 minutes here, and 74% used the headhole. Forty-five percent of all visitors were observed reading aloud and 60% pointed or gestured. Two thousand visitors were observed at the sign inviting them to compare measurements with gorillas. 93% of all families, 84% of the singles and 100% of all school groups made at least some of the comparisons. 1,900 individuals observed "Who's Who," and 76% of them stopped to look, read and comment. But, this graphic takes about 2.5 minutes to read and the average visitor spent only 68 seconds here. Of 2,000 individuals observed at the King Kong graphic, only 64% of the families and 60% of the singles bothered even to glance at it. Test Your Gorilla IQ proved to be the second-most utilized sign. Of 1,900 surveyed here, 74% of families and school groups, and 60% of the singles stopped to test themselves, with about 59% going on to complete the activity. the longest time observed here was 14 minutes, by a school group. "When the last...." was designed as a "walkalong" message. Of the 2,200 observed here, half or more of all groups surveyed stopped to read or look, and 27% were recorded reading aloud.

Taylor, L. 1983. "Of Potholes and Patrons". Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Vancouver, BC, Canada.

This paper discusses the public image of zoos and what it takes to bring the public and the zoo's message together.

Terwilliger, L., 1984. Evaluation Project. Smithsonian Institute. Unpublished.

The new reptile program was evaluated and compared with the elephant program on the basis of 108 interviews. Findings were descriptive and preliminary only.

Thomas, W. and G. Downing, 1963. The Role of the Zoo in Public Education. International Zoo Yearbook, 3. London: Zoological Society of London.

Zoos can get their educational message across through the use of signs, guided tours, publications, lectures to civic groups by zoo staff, newspapers. radio and television. Field trips to the zoo by classes are a desirable experience for students. The Oklahoma City Zoo uses all these techniques to enhance existing community educational programs.

Thompson, K., December 1985. Evaluating Animal Exhibits and Husbandry with Day-long Observation. Animal Keepers Forum

Behavioral research is an invaluable part of the efforts to improve the quality of captive care but large-scale investigations are beyond the resources of most zoos. The problem can be overcome by training volunteers who then can conduct day-long observations to identify activity patterns, spatial preferences and behavioral problems in particular exhibits. Activity cycles for behavioral events can be constructed by graphing frequency by time of day; for behavioral states presenting percent of time spent in each activity by time of day. Spatial preferences can be evaluated by recording amount of time spent in each area of the exhibit, using 5-minute intervals. These can be analyzed jointly to determine whether or not animals are exhibiting species, age, and sex appropriate behaviors, or to identify stereotypic behaviors.

Analysis of informal observations is a simple, inexpensive technique for obtaining information useful in making husbandry improvements, and provides a starting point or way of selecting exhibits for in-depth investigation.

Throp, J., 1975. People Involvement Innovations at the Honolulu Zoo. International Zoo Yearbook, 15. London: Zoological Society of London.

Devices to overcome visitor fatigue include variation of rather than standardization of signs to reduce boredom. Specifically, signs can be varied in shape, texture, materials, lettering and angles. Some may be humorous. Some may address ecological, some behavioral, topics. Alternatives to merely viewing animals can also be devised, such as a "people island" next to the traditional "monkey island" on which people can climb and brachiate, or a tower which allows visitors to look at giraffes at eye level.

Truett, B., 1985. Interpreting the Alien Language. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Birmingham, AL, 1985.

The first step in interpreting nature to people is naming animals. AAZPA should have a committee to standardize the common names of animals. This committee should establish the best common name for each species and the proper pronunciation for each. The zoo profession has the influence necessary to standardize and correct the common names of animals and to get the best names into use throughout America.

The proper naming of the animals is an essential part of interpreting the alien language of nature to people. Each area and each exhibit should have a clearly identified purpose.

Tucker, W., 1982. Progress and Privilege: America in the Age of Environmentalism. Garden City, NY: Anchor Press/Doubleday.

A basically Marxist interpretation of the environmental movement, noting that upper- and middle-class Americans who already are wealthy and comfortable are using environmentalism to keep the working- and lower-classes down. A provocative critique despite the bias.

Turkowski, F., 1972. Education Programme at the Phoenix Zoo. International Zoo Yearbook, 12. London: Zoological Society of London.

The goal of the Phoenix Zoo Education Department is to provide educational activities for persons of all ages and academic levels. Established programs children include those on natural history and arts, school tours, and desert animals. The also is a pet care course, the Boy Scout Nature Merit Badge series and a science and nature movie series. Topics addressed in the natural history class include animal care, feeding, acquisitions, cage safety and other zoo management problems. There also are instructions on zoology, conservation, wildlife management and animal behavior. Students learn to identify poisonous and non-poisonous Arizona animals. The arts and crafts class uses plants and animals as subjects for a wide variety of projects and includes nature walks to find natural objects such as feathers, bark and stones for us in their projects. The pet care course features discussions with zoologists, keepers and trainers, is comprised of six 2-hour sessions, and allows each child completing it to select a mouse, parakeet, chameleon, newt, or Siamese fighting fish as a pet, which is provided with an appropriate cage or aquarium. The desert fauna and animal behavior classes are aimed at those with more than a passing interest in animals. Upgraded versions of the classes are aimed at adults. Donations of literature provide the beginnings of a library, and access to the Arizona State University library has been arranged for staff. Future plans include a Junior Zoo Keeper and Practical Biology course and the enlargement of live and prepared teaching specimen collections.

Turner, W., 1986. Observations on Conservation and the Zoo Visitor. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Studies by Kellert of American attitudes toward wildlife include data on various animal-related activity groups including zoo visitors in North America. These seem to have a strong affection for individual animals, but only peripheral interest in wildlife, natural values or ecological considerations. The challenge for zoo educators to broaden zoo visitor's concerns for the welfare of individual animals to a caring for the preservation of the species and its habitat in the wild. Ways to make this transition must be developed if zoos are to help achieve the goals of the World Conservation Strategy.

Uchida, I., 1973. New Educational Displays in the Himeji City Aquarium. International Zoo Yearbook, 13. London: Zoological Society of London.

Himeji City Aquarium was opened as a museum and research center. Fish behavior experiments are carried out for the visitors, and often permit their involvement in the experiment. For example, the blind cave charcin fish can avoid objects place in the water. Visitors are provided with a wheel that allows them to move obstacles to experience this fact for themselves. Or, an exhibit that permits visitors to change bottom color by rotating a resin disk under the transparent bottom of the tank, and observe the changing color of fish such as sole while listening to a tape recording explaining the phenomenon. Or, visitors can alter current and objects to determine which of the two fish remaining still are adjusting to. This involvement enhances both visitor interest and learning.

Uchida, I and M. Asuke, 1982. The Touch Tank at the Himeji City Aquarium. International Zoo Yearbook, 22. London: Zoological Society of London.

Urban growth, pollution and environmental destruction have made direct experience of nature rare for children, even in outlying cities. An illustration of the result can be seen in the reactions of children taking part in the 1978 annual summer educational program at Himeji City Aquarium. Only half the participants were able to hold 5 cm crayfish. Adults, brought up in more natural surroundings, find this reaction difficult to understand. To discover nature through contact with other living creatures is an important and meaningful part of a child's development. Details of the design, construction, maintenance and stocking of a touch tank (with coelenterata arthopoda, mollusca and echinodermata) are provided.

Van, K. and J. Nightingale, March 1986. Potential Cooperative Research and Educational Programs: Oregon Coast Aquarium and Oregon State University. Newport, OR: Oregon Coast Aquarium.

Potential areas of cooperation and mutual interest between Oregon Coast Aquarium [OCA], Oregon State University [OSU] and the Mark Hatfield Marine Science Center [MHSC] were explored in conjunction with the development of OCA, to insure that needed facilities were included from the beginning. The study led to additions and changes in the planned OCA physical facilities, to identification of opportunities for joint programs, and to development of two pilot programs.

Physical changes included addition of a multiuse room designed to meet the varied needs of 11 OSU departments, spare desk space, provision for group entry, off-exhibit holding space for both animals and plants, flexible display space, a Coastal Culture Exhibit, a data collection system including provision for data useful for the hotel, tourism and restaurant program, estuarine research space, and a wave machine. Changes were made in the marine mammal display pools and laboratory facilities. A significant number of possible joint programs were identified and classified under five major headings. Two were selected for pilot program development, including an educational program aimed at elementary children and a research program involving tagging and release of harbor seals.

Van den Bergh, W., 1966. Zoos and Education. International Zoo Yearbook, 6. London: Zoological Society of London.

It is necessary to make the public conversant with an animal species before one can succeed in arousing interest in its protection and conservation. In a heavily industrialized country such as Belgium the majority of visitors are not acquainted with the animal world. It is necessary to stimulate interest and to educate inconspicuously, attractively and simply as possible if one is to succeed with this audience. But, attention must also be paid to the small groups of pupils, naturalists and conservationists who all come to the zoo for well-defined purposes.

The first requirement then is for attractive exhibits, which requires improvement and enlargement of animal enclosures and to the general appearance of the zoo itself. The second is labels aimed at the general public, which require attention to details of durability, readability, location and content. They can show aspects which cannot always be observed in captivity, such as defense postures, parasites and enemies. A third requirement is instructional objects aimed at students which can easily evolve into a natural history

museum associated with the zoo. A fourth requirement is for temporary exhibits on special topics, such as recent ones devoted to sculpture, drawings and paintings which have animals as their subject, to the Galapagos, to the four season, and diseases. A fifth requirement is publications, including both scientific bulletins and a magazine oriented toward the general public. A sixth requirement is a lecture series on topics such as conservation, entomology, mycology, conchology, dendrology, and ornithology. A seventh requirement is to make school visits valuable, which in turn requires instructional help to schools and teachers, including supplementary materials and objects, escorted tours, lessons by zoo staff, and a prize competition to encourage interest in nature and the study of nature that provides four scholarships annually. Antwerp also supports the work of the Royal Academy and the Higher Institute for the Fine Arts and has a large library of concert music scores and a modern complex of halls with seating accommodation for audiences of 2200, 450, 200 and 100--many citizens look upon the zoo first as a music society!

Van den Brink, J. 1981. The Role of Labels in the Zoo. International Zoo Yearbook, 21. London: Zoological Society of London.

Zoo labels should inform the public as accurately and fully as possible. the written label still is the basic or only source of information for the majority of visitors. They should be designed to attract the attention of as many people as possible and to provide accurate, stimulating and sufficient information.

Van Diver, M., 1978. Keeper Training at Santa Fe community College: A Progress Report. International Zoo Yearbook, 18. London: Zoological Society of London.

At the time of this report, the Santa Fe program has been in operation for six and one-half years. The author feels it is an unqualified success, measured by the number of students enrolled each term, by the proportion that graduate, by the response of employers to graduates applying for jobs, and by the development of the park itself. The program and the teaching zoo have evolved and grown significantly since its inception.

Vernon, C., 1986. Indiana Zoos Team up to "Think Globally and Act Locally." Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Educators from six zoos in Indiana teamed up with the State's Department of Fish and Wildlife to produce a portable, self-contained kit focusing on endangered species of Indiana. The kit includes a notebook of approximately 40 multi-disciplinary activities, replicas of animal tracks, two slide programs, a filmstrip, posters and photos. Teachers use the kits to supplement existing curricula and as the basis for specific science units. A test administered to students before and after using the kit helps determine effectiveness of materials. presently each zoo has one kit and is responsible for marketing and scheduling in its area.

Vesolovsky, Z., 1966. Educational Work of the Prague Zoo. International Zoo Yearbook, 6. London: Zoological Society of London.

The educational program at Prague has three components aimed at recreational visitors, school children, and club and society members. The major problem with the first group is their number, which made short talks in front of selected animal groups impossible. Instead, three types of labels have been developed. The first type deals with groups of animals deals with biology or anatomy, are are about one page in length, including illustrations. The second type consists of labels for individual species. The third consist of talking labels that emphasize some specific relevant information. Work with schools is run on two levels, consisting of talks aimed at pupils under ten stressing the affinity of children and animals, and classes for older students for which are coordinated with the biology curriculum, which is in turn coordinated with animals available at the zoo. The last part of the program is education of the public with particular interests in animals through clubs and societies, including those independent of the zoo.

Washburn, W., 1975. Do Museums Educate? Curator, 18, 3.

Asserts that collection and preservation alone do not justify the existence of museums but that they have an educational responsibility that they have failed to meet until they have clearly demonstrated that they are achieving it. Washburn concludes that the answer to the question of his title is an emphatic No!

Webb, E., et. al., 1981 (2d ed). Nonreactive Measures in the Social Sciences. Boston: Houghton Mifflin Company.

Weigman, P. and P. Weigman, 1973. The Smithsonian Grasshopper. Washington, DC: Smithsonian Institution National Museum of Natural History (unpublished).

Weiss, R. & S. Boutourline, 1983. The Communication Value of Exhibits. Museum News, 42, 3.

Twenty-two family groups visiting a museum tended to walk along the right wall and to circulate in a counter-clockwise direction, stopping to look at exhibits of special interest. They rarely crossed from side to side unless forced to do so by the positioning of landmark exhibits.

White, J. 1983. "Our Public Image: The Family Visitor". Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums. Vancouver, BC, Canada.

Zoos are family attractions and the largest percentage of visitors are families. They come to the zoo to see the animals, to interact with each other, and to have fun. Learning rarely is mentioned as a purpose. To achieve the educational goals of zoos in a fashion that recognizes the social and recreational agenda of family visitors, the National Zoological park has established a learning lab in the Reptile and Amphibian House, called HERPlab. Hands-on involvement and interaction is stressed. Materials are geared to family groups. the follow-up interviews revealed that families who visited the lab acknowledged that they had learned something.

White, J. and S. Barry, 1984. Science Education for Families in Informal Learning Settings: An Evaluation of the HERPlab Project. Smithsonian Institute. Unpublished.

HERPlab, a learning center designed to teach families about reptiles in the informal setting of a zoo, was field tested at National Zoological Park (NZP), Philadelphia Zoological Garden and the John Ball Zoological Gardens in Grand Rapids. General topics were communication, anatomy, reproduction, conservation, husbandry, locomotion, social behavior, feeding and feeding adaptations and classification. Ten activity boxes were developed around these topics, tested and revised. Supplemental materials were developed but varied among field test sites. NZP had a reptile keeper area, lizard display, microscope area, skeletal display and 8mm film loops.

Evaluation of HERPlab was based on questionnaires completed by 1191 visitors, open-ended interviews completed by 205 visitors to HERPlab and 60 zoo visitors who did not reach HERPlab as an ad hoc control group, and--at NZP only--open-ended interviews completed by 21 visitors.

Family groups with one or more children under age 12 predominated. They spent an average of 30 minutes in the lab and 10 minutes at each activity box,

vs. averages on the order of 30-45 seconds at more traditional exhibits typically reported in other studies. Some activity boxes were more popular than others but all were of interest to some, reinforcing the importance of making a broad range of choices available. Visitors cited an opportunity to look closely, to do things, to touch real things, the focus the boxes gave to their observations, the challenge of the quizzes and questions and being allowed to try activities at their own pace, in groups or by themselves, as reasons the boxes appealed. The evaluation identified as important a pleasant, comfortable area (that did not become too hot when crowded) where visitors could sit down, aspects educators tend to overlook when focusing on educational objectives. The more general impacts were enjoyment, learning, increased appreciation of animals and--at the NZP site--strengthening family relationships.

Whitehead, M., 1986. Fruit Bats Affect Your Life. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

North, south, logging, breeding, feeding, draining, raining, soil, toil and Bob Gelcof. What does it all mean to the good citizens of Market Bosworth and Barton-in-the Bean? Recent innovations at Twycross Zoo to link global and local environmental issues using the zoo's animal collection as a starting point for novel interactive devices for schools and general visitors including Peek-a-Zoo, Earth Truck and Mini Canal are described.

Willis, J., 1977. Visitor Analysis at the Cincinnati Zoo with Implications for Interpretive Planning. Columbus, OH: Ohio State University (unpublished masters thesis).

Wilson, L. 1981. Family Activities at Shedd Aquarium. Paper presented at annual meeting of American Association of Zoological Parks and Aquariums. New Orleans, LA.

The following generalizations were presented about family use of Shedd Aquarium: Family members interact with each other more than they attend to exhibits. They explore on a very general basis until an exhibit catches the interest of one member and concentrate much more time on that exhibit. Parents participate largely through the activities of their children.

Building on these characteristics and limited by the difficulty of promoting visitor interaction with exhibits in aquariums led to programs where parents and children interact with one another in structure activities. Efforts are being made to find out what and how families learn in these programs.

Preliminary observations indicate that school groups interact differently than family groups.

Wixom, D., 1982. Development of an Education Program at a Small Zoo. Paper presented at the Central Regional Conference of the American Association of Zoological Parks and Aquariums. El Paso, Texas.

This paper describes the development of a successful education program at a small zoo. Management skills, imagination and initiative transformed a small Kansas zoo from a questionable position in the community into the only city department to record a profit in 1981. Of particular interest is the bibliography and description of the docent training program.

Wixom, D., 1985. An Overview of the Animal Program at Sunset Zoological Park. Paper presented at the annual regional meeting of the American Association of Zoological Parks and Aquariums, Oklahoma City, OK.

The docent program was loosely formed and self-administered. Docents were responsible for teaching themselves about the collection and the handling of animals. In developing a program, the author was acutely aware that no matter how serious the intent, a live animal program is a show.

Wolf, R., M. Munley, & B. Tymitz, 1979. The Pause that Refreshes: A Study of the Discovery Corners in the National Museum of History and Technology. Smithsonian Institution.

The purpose of the study was to assess the viability (not effectiveness) of "Discovery Corners." Data was collected on three Discovery Corners, each with a distinct location, staff and set of educational objectives. They were 1) Spirit of 1776, 2) Electricity Discovery Corner, and 3) Rehabilitation Discovery Corner. The study encompassed five months from the initial set of negotiations to the final debriefing session. The data reported is based on formal interviews with well over a hundred visitors to the Corners. Numerous other, more informal interviews were conducted with museum staff, volunteers and visitors.

Family groups and adults predominated among visitors; most attendance was spontaneous; few visitors read the overhead signs; and seated visitors spent more time at the exhibits than those who remained standing. The two critical factors which influence audience attendance are the location of the Corner within r hall and general attendance in the adjacent hall. Although there are more visitors on the weekend, there was no significant difference in visitor behaviors or reactions based on time of day or day of the week.

In designing such exhibits, considerations that should be taken into account include name, location, length of presentation, schedule, level of presentation, staff training, inclusion of handleable objects, means of stimulating visitors to explore the exhibit and collection of assessment data.

Wolf, R. & B. L. Tymitz, 1979. Do Giraffes Ever Sit?: A Study of Visitor Perceptions at the National Zoological Park, Smithsonian Institution. Washington, DC: Smithsonian Institution.

This study was conducted to gain understanding of visitors' perceptions of the zoo experience. The researchers sought to learn why people come to the zoo, the value of their visit, what they learn, and how the overall experience impacts visitors. Six months unobtrusive observation and over 300 conversational interviews of both visitors and zoo staff were combined in what the authors call "naturalistic evaluation." This approach allows the shape and direction of the research to change over time rather than requiring adherence to a static plan aimed at testing predetermined hypotheses that may fade in importance as knowledge increases.

Visitors came to the zoo for mental and physical relaxation, entertainment, education and as a family tradition. They often initiated and maintained interactions with keepers, zoo tour guides and even the researchers. Visitors tended to cluster around any zookeeper talking about an animal or exhibit, and both children and adults initiated questions. Many visitors assumed teacher roles for others by relaying information about the animals.

Wolf, R. & B. Tymitz, 1981. The Evolution of a Teaching Hall: "You Can Lead a Horse to Water and You Can Help it Drink. A Study of the Dynamics of Evolution Exhibit. Office of Museum Programs, Smithsonian Institution.

This study was undertaken to determine how effectively the "Dynamics of Evolution" exhibit at the Smithsonian Institution conveyed information to visitors. Observations and conversational interviews were combined in a method the authors call "naturalistic evaluation." Observation identified "Magnet Areas" where individuals tended to linger and group together. Interviews determined exhibit impact through questions as to what had interested visitors, what they learned and how exhibits might be improved. Demographic information including gender, race, residence, occupation, age, education, income level and familiarity with the exhibit was collected. The length of time spent at selected points was presented with information on the traffic flow of visitors. Relative "wear and tear" also was used to determine relative interest in exhibits. Visitors' conversations, and spontaneous comments and behaviors such as picture taking were also recorded in an unobtrusive manner.

Wolf, R. and B. Tymitz, 1981. Studying Visitor Perceptions of Zoo Environments: A Naturalistic View. International Zoo Yearbook, 21. London: Zoological Society of London.

This study is aimed at understanding why visitors come to zoos, what they learn, whether they visit has been of value and the overall impact of the experience. Three hundred visitors were interviewed. Interviewers did not utilized a standard set of questions to preserve the naturalness of the interaction with visitors.

Visitors perceptions of the zoo were affected by cleanliness of exhibits and whether they perceived the animals as being comfortable and well cared for. Visitors indicated a desire for more information about the animals but preferred to get this information from keepers or roving guides rather than signs.

Wolf, R. & B. Tymitz, 1980. When Will The Fourth Floor Be Open?" A Study of Visitor Perceptions of the Hirschorn Museum and Sculpture Garden. Smithsonian Institution.

Demographics and perceptions of visitors to the Hirschorn Museum were studied to guide museum planning and development. Over 300 hours of observation and 743 conversational interviews in a method the authors call naturalistic evaluation were conducted during an eight month period. Visitors were asked to evaluate the quality and meaning of the museum experience. This strategy of combining observation and interview procedures has proven to be extremely helpful in revealing both cognitive and affective dimensions of museum visits.

Demographic data revealed more females than males visit the museum. White visitors are distributed among local residents and tourists, while few Black visitors were almost exclusively tourists. Students, professionals and white collar workers predominated. Many came to learn about modern art, to expose their families to modern art or similar educational purposes. Most visitors spent at least two hours in the museum, with a small portion spending up to four.

Wolf, R. & B. Tymitz, 1979. East Side, West Side, Straight Up the Middle, A Study of Visitor Perceptions of "Our Changing Land". The Bicentennial Exhibit. National Museum of Natural History.

The degree to which the exhibit "Our Changing Land" achieved the goal of instructing Smithsonian visitors about ecology was assessed through unobtrusive observations of natural behavior and conversational interviews were combined in a technique the authors call "naturalistic evaluation." Data collection took about 6 months and involved several hundred hours of observation time and 175 visitor interviews.

Visitors typically spent 10-12 minutes at the exhibit. Almost all described it as "realistic". Less than 16% of the visitors read all the signs describing each display in the exhibit. The results also showed that most of the visitors understood ecology, which was the major theme for the exhibit, but did not understand the subthemes of the exhibit which were the reasons for the ecological changes the exhibit displayed. i.e. industrial pollution and population growth. The likely reason is that the subthemes are the topics of the signs few visitors read.

Wolf, R. & B. Tymitz, 1978. Whatever Happened to the Giant Wombat: An Investigation of the Impact of the Ice Age Mammals and Emergence of Man Exhibit. Washington, DC: Smithsonian Institution.

On the basis of observations conducted in the Ice Age Mammals Hall in the Smithsonian, Wolf and Tymitz suggest four categories of museum visitor, without indicating the proportions in each:

The Commuter uses the hall exclusively for transit to some other (uninvestigated) place. Many were teenagers.

The Nomad seems to be wandering about, unsure why he or she is there, looking for something in which to become interested. The Cafeteria Type wants to get interested in something, so treats the entire museum and the hall itself as a cafeteria.

The VIP (Very Interested Person) may or may not have come specifically to the hall, but once there goes through carefully, slowly, critically.

It is inappropriate to conclude that the exhibit was "better" for the VIP than for the nomad. Visitors should not be measured against a fixed standard, but in terms of their own purposes. Nor should exhibits appeal only to one kind of visitor (Unlike a school, museum visitors do not have to learn the same thing).

Visitor pairs appeared to attend better to the exhibit than persons either going through by themselves or persons going through in a group larger than two. There appears to be an optimal number of visitors in an exhibit at a single time. When there are very few people in the hall, there is a tendency for those people to move through rather quickly...Likewise, when the hall was very crowded, people seemed to be too caught up in the crowd and not as attentive to the dimensions or the areas within the hall. There appears to be an optimal number that increases visitor attention. Weekday crowds taper off between 3:15 and 3:30.

Wolf and Tymitz suggest that interviews are best conducted in the morning. While no one refused to talk with them at any time, they seemed tired and pressed in the afternoon.

The exhibit involved a number of major themes, e.g., glaciation, periodicity of climate change, sea level changes, giantism, emergence of man, mass extinction. Visitors seemed at least vaguely aware of this. One said "In the other exhibits I don't have a lot of choice so I can't learn about the

idea because I choose not to learn about it the way they show it." Another said "The exhibit has a flow to it and that helps to show the messages. The hall gave me a feeling that there was a message here. I feel like I could come back again and still learn something about it."

None of the visitors were surprised at questions about what they learned in the hall. All readily accepted the assumption that they should have learned something.

Observation determined that almost all visitors read some exhibit signs. But signs must be altered to meet differing information needs and learning styles. The first level may be to identify and describe. At the second level might use questions, to encourage observation, a different learning style. Another level might describe current research or controversies. Designers can take advantage of different ways to learn: from objects, from space, from sound, from various media. But some concepts, such as spatial relationships, are so subtle that they are likely to be missed unless other devices are used to increase the probability of learning.

Wolfgang, P. and R. Pugh, 1986. A Process Description of Literature Evaluation, Walkthrough Post-Occupancy Evaluations, A Generic Program and Design for the City of Albuquerque. Proceedings of the 1986 Environmental Design Research Association.

Three levels of post-occupancy evaluation are suggested as components of a process model. The initial level, called indicative, usually involves a walk-through of the facility and relies on the knowledge and skills of the evaluators. It requires relatively little time and effort and the emphasis is on problem identification. The second level, called investigative, focuses on short-term problem solving and recommendations not requiring major construction. The third level, called diagnostic, requires multi-method approaches (e.g., interviews, surveys, observations, and physical measurements) and is oriented toward long-term, state of the art improvements.

Wolinski, Z., 1974. A Programme for Blind Children at Warsaw Zoo. International Zoo Yearbook, 14. London: Zoological Society of London.

Models, stuffed and live animals and animal objects such as birds eggs are used in combination to provide blind children with knowledge of animals that they could not otherwise acquire. Models and stuffed animals can give children an idea of shape, but not size or of how it moves, smells or of other signs of life. Exotic animals selected have included young bears, lions, primates, and armadillos, hedgehogs, an elephant, a camel, a pony and a donkey. Birds that have been used successfully have been a stork, pelican, and pigeon; reptiles have included a tortoise.

Blind children are diligent and accurate observers making great use of touch, hearing and smell. Typically, they will notice details such as the number of toes on the fore- and hind-legs of a guinea pig or the identifying notches cut into the ears of some species. Older children are as interested in the work of the keepers as in the animals themselves. An indispensable factor in the success of this program is careful selection and training of the guide, who must be able to adapt methods to the perceptions of blind children of varying ages, abilities and interests.

Woodard, E., 1967. Educational Programme at Indianapolis Zoo. International Zoo Yearbook, 7. London: Zoological Society of London.

The purpose of the educational program at Indianapolis is to give children a wider understanding of the animal world by teaching them about exotic animals and the care of pets. The facility developed to accomplish these purposes, and the programs to accomplish them, are described. These involved summer lecture and film program and a popular puppet show teaching respect for animals. During the school year, school trips end with a half-hour lecture on various topics, which can be selected in advance by the teacher or left to the center staff. During January, coinciding with an 'Animals in Art' poster contest, children are provided with animal models.

Yaacob, N., 1986. Thoughts from the Tropics. Paper presented at the meeting of the International Association of Zoo Educators, Melbourne, AUSTRALIA

Malaysia is a tropical country, with a tropical rainforest, which is being cut down for timber, which is made into plywood, which you buy so we can earn money to buy goods from you. Teaching conservation for us is not quoting alarming statistics. They fall on deaf ears. We teach our people about the wealth of their natural heritage. This wealth they inherited from their parents. This wealth they must pass on to their children.

Yerke, R. 1982. Out of the Museum and on to the Zoo Grounds: Arthopod Discovery Boxes at the Washington Park Zoo. Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Phoenix, AZ.

Learning boxes were developed for the Insect Zoo at Washington Park which presented instructions, specimens and questions. 141 family groups were observed using the discovery boxes over two summers. The time spent at the various boxes was taken as a measure of effectiveness. It was concluded that they represent an effective added experience for zoo visitors.

Yerke, R., 1984. Families: What Are We Doing For Our Largest Audience? Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Miami, FL.

Many zoos are collecting information on family visitors to develop programs specifically for them. One form this effort takes is development of classes that provide opportunities for interaction among family members. Such classes accomplish both major goals families have for visiting zoos and major goals zoos have for educating the public and enhancing the perception visitors have of zoos.

Yoshioka, J., 1942. A Direction Orientation Study with Visitors at the New York World's Fair. Journal of General Psychology.

3005 visitors composed of near equal numbers of both sexes were tracked in the Medicine and Public Health Building of the New York World's Fair in 1939. The records were analyzed in terms of first turn, entrance exit relationship and route. The building consisted of two halls, the Hall of Man and the Hall of Medicine, connected by a ramp. At the entrance to the Hall of Man the right turns predominated over the left turns, while at the Hall of Medicine, they were about equal. The cause was attributed to the

attractiveness of exhibits near the entrances. Inferences were drawn [somewhat mysteriously] about the motivations that led individuals to move in different patterns.

Zahn, M., 1974. The Use of Educational Films in Aquaria Displays. International Zoo Yearbook, 14. London: Zoological Society of London.

Film loops are used in conjunction with displays particularly to explain the behavior of relatively inactive animals which visitors are prone to attempt to disturb into activity by tapping aquarium glass. Experience has led to shortening films to 5 from 12 minutes and minimizing titles, with the result that 75% of visitors view some of the film and 50% of visitors watch it from beginning to end.

Zeigler, C., 1987. Fundraising in the Private Sector...Back to Basics! Paper presented at the annual meeting of the American Association of Zoological Parks and Aquariums, Portland, OR.

The backbone of fundraising is the support of the community. Corporations and major individual donors will contribute to an organization that has strong community involvement. In turn, this begins with a prestigious Board of Directors who understand your needs and how they can help. Staff and volunteers should know what is needed, spot potential donors, and be kept informed of progress. Once this infrastructure is in place, concentrate on identifying donors and their giving potential, mechanisms for reaching them, how you will keep them, and what they will receive in return. The more you personalize your approach, the more successful you will be. Donors are more likely to give to a friend than to a stranger, so you need to become their friend. They are more likely to remain donors if they have a sense of ownership, best achieved through programs such as Adopt an Animal, a Founders Club, special recognition, sneak previews, and the like. Provide several avenues of involvement and don't overlook the advertising and marketing of fundraising drives, both in the community and on your own grounds.

Zwirner, F., 1975. The Youth Club at Tierpark Berlin. International Zoo Yearbook, 15. London: Zoological Society of London.

A Youth Club has operated for a decade in conjunction with the Tierpark. About 350 students age 12 and up now are members, in 26 interest groups (mammals, small mammals, birds, insects, botany, biological drawing, photography, etc.) of 12-15 individuals that average 20 meetings per year. Groups plan their own annual activities, which not only aim at discovery of general concepts in biology, ecology and even philosophy, but development of qualities such as perseverance, precision, conscientiousness, and neatness. are encouraged. Space, rather than interest, limits the club's activities.

Zyskowski, G., 1981. How Not to Conduct a Naturalistic Evaluation: Rueful Reminiscences of a Museum Evaluator. Presented at the annual meeting of the Evaluation Network. Austin, Texas.

Based on experience conducting naturalistic research at the Toledo Museum of Art, the author makes several recommendations. Pre-set hypotheses generally are not appropriate but advance preparation and thought is. The relative laxity in setting specific evaluation questions when working in a

naturalistic mode should not be misunderstood as an "easy out" by researchers. Questions should be determined in advance but an iterative framework is required and should be based on sharing relevant data with the evaluation audience.. On this basis the the original questions should be reassessed and expanded when necessary. This approach enables the evaluator to respond promptly to the clients' needs. The evaluation audience must not be overladen with a lot of terminology and methodological considerations they do not comprehend or care about. The emphasis must be on information that has immediate and practical use.