ENVIRONMENTAL EDUCATION THROUGH MUSEUMS

A CASE STUDY OF THE ECOLOGY EXHIBITION IN THE NATURAL HISTORY MUSEUM, LONDON

THE NATURAL HISTORY MUSEUM, LONDON, BY COURTESY OF THE NHM

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF PHD (DOCTOR OF PHILOSOPHY)
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This researcher's view is that, "the most urgent task for human beings is to stop the destruction of our physical environment." It is his view that public awareness of this situation must be raised by means of environmental education especially as community education. This is what this researcher sees as the particular role of museums.

This thesis consists of three parts. These are as follows.

1. **Historical Analysis (Background), (chapters 1, 2, 3, 4)**
   First of all, this thesis looks into "Museum Education in General", including definitions of museum, and history of museums and museum education. Secondly, "Environmental Education" is examined both generally and specifically through museums. Thirdly, in order to research how to set up effective educational exhibitions, "Visitor Studies for Museum Education" are examined. Then, the "Research Focus and Approach" are discussed including research methodology and secondary data analyses.

2. **Present Condition (A case study), (chapters 5, 6, 7)**
   This case study of the Ecology Exhibition in the Natural History Museum, London consists of several methods and points of view. First of all, the exhibition is examined from the physical standpoint such as publicity, organisation and physical conditions named "Physical Analysis". Secondly, it focuses on visitors' psychological points of view using the methods of observation, questionnaire and interview named "Psychological Analysis". Thirdly, the social influences of this exhibition upon visitors are examined using the methods of questionnaire, ecology quiz, interview (in the gallery and streets), and mailed questionnaires to schools. This method is called "Sociological Analysis" as interpreted and used by this author.

3. **Future Role (Contribution), (chapter 8)**
   This final part is a brief summary of the case study, using some diagrammatical descriptions in order to throw extra light on the issues of museums and environmental education. It suggests a future role for ecology museums so as to save our vulnerable planet and to pass it on whole to the 22nd century, which is this author's ultimate objective.
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Mr Ashley Kent: Senior Lecturer and Geography Coordinator of the Geography Section in the Institute of Education, University of London.

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The earth itself has been changing over billions of years. The changes have shown themselves, of course, not only geologically and meteorologically but also biologically through evolution. All these changes were natural before *Homo sapiens sapiens* evolved. However since then we human beings have committed a lot of crimes against the environment. We now believe that the earth is one vast living organism as the Gaia hypothesis (by Lovelock J. in 1979) suggests. If so, we human beings might be called parasites which give nothing to the earth, but indeed actually harm it in return. This will result in our own death if some action is not taken immediately to remove the problem.

Needless to say, we humans have investigated the cause of the destruction of nature, and tried to recover the environment from its destruction. For example, most countries have an environmental agency as a government organisation, and pupils are taught environmental education in schools. Also there are countless NGOs (Non Governmental Organisations) related to the environment through the world. Nevertheless nowadays the pace of improvement in resolving environmental issues is less than the pace of the destruction of the environment, because the causes of these problems are so much more complicated for global scale political and economic reasons.

However we must bear in mind that, in any circumstances, the most urgent task as human beings is to stop the destruction of our physical environment. In order to carry this out, public awareness of this situation must be raised more and more by means of environmental education not only as school education but also as community education. This is where this researcher sees the special role of museums, because museums can teach the public "ecology", the study of the
relationships between living organisms and their physical environment, by means of real objects and personal experiences using their 5 senses that is vision; hearing; smell; touch; and even taste, rather than the written word alone.

The definition of museums differs slightly in each country. However a characteristic common to all is that they are not only so-called museums, but also include historic houses, planetaria, botanical gardens, zoological parks, and aquaria. This range of museums might give the public much more opportunity for learning the subject and at the same time it might make the public more aware of the environmental issues as urgent problems affecting themselves.

For this reason this researcher wants to examine environmental education through museums in the past and present. The aim of this research is as follows.

AIM OF THIS RESEARCH

- How to educate about environmental issues through museums, especially through ecology exhibitions, in order to save the earth.

The ultimate aim of this research is to create effective environmental education for the public through museums, especially to set up educationally effective "ecology exhibitions" describing the "human impacts on the environment", in order to save our indispensable planet.

This thesis will consist of three parts. These are as follows.

1. Historical Analysis (Background), (chapters 1,2,3,4)

First of all, this thesis looks into "Museum Education in General", including definitions of museums, and history of museums and museum education.

Secondly, "Environmental Education" is examined both generally and
specifically through museums. Thirdly, in order to research how to set up effective educational exhibitions, "Visitor Studies for Museum Education" are examined. Then, the "Research Focus and Approach" are discussed including research methodology and secondary data analyses.

2. Present Condition (A case study), (chapters 5, 6, 7)
This case study of the Ecology Exhibition in the Natural History Museum, London consists of several methods and points of view. First of all, the exhibition is examined from the physical standpoint such as publicity, organization and physical conditions named "Physical Analysis". Secondly, it focuses on visitors' psychological points of view using the methods of observation, questionnaire and interview named "Psychological Analysis". Thirdly, the social influences of this exhibition upon visitors are examined using the methods of questionnaire, ecology quiz, interview (in the gallery and streets), and mailed questionnaires to schools. This method is called "Sociological Analysis" as interpreted and used by this author.

3. Future Role (Contribution), (chapter 8)
This final part is a brief summary of the case study, using some diagrammatical descriptions in order to throw extra light on the issues of museums and environmental education. It suggests a future role for ecology museums so as to save our vulnerable planet and to pass it on whole to the 22nd century.
CHAPTER 1

HISTORICAL ANALYSIS

MUSEUM EDUCATION IN GENERAL

A MUSEUM EDUCATION SERVICE AT THE CASTLE MUSEUM IN THE UK IN THE 1920s

(HOOPER-GREENHILL E. 1991. MUSEUM AND GALLERY EDUCATION)
Before discussing museum education, we should make sure of the definition of "museum". It is necessary to begin with an understanding of what a museum is (Burcaw 1990:3). This is vitally important, because most people think that a museum, in short, is a building which exhibits some old objects. (1) There is some truth in the notion. However it sounds too scientific and dull. Similarly the Oxford Advanced Learner's Dictionary suggests that a museum is "a building in which objects of artistic, cultural, historical or scientific importance and interest are displayed" (Hornby 1990:816). Needless to say, a dictionary describes the meaning of a word concisely, so the description is not always relevant to helping readers understand the whole meaning. The problem with these definitions is, firstly, a museum is not always in a building; secondly, it aims at educationally affecting the general public; and thirdly it also offers recreational opportunities to the public.

In addition it is important to research other definitions.

(A) ICOM DEFINITION

There have been many definitions of a museum over time and throughout the world. For instance, George Brown Goode mentioned the definition at a general meeting of British museums in 1895:

"A museum is an institution for the preservation of those objects which best illustrate the phenomena of nature and the works of man, and the utilization of these for the increase in knowledge and for the culture and enlightenment of the people" (Burcaw 1990:9).

(1) The author's interviews with a variety of people in London, 1992-3.
This idea emphasizes the enlightenment of the people, and also does not insist that the institution is a building.

Nearly one century later Goode had defined a museum in 1989, as:

"a non-profit making, permanent institution in the service of society and of its development, and open to the public which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment" (ICOM - International Council of Museums - Statutes 1990:3).

Also, the term "institution" is defined by ICOM as follows: in short,

1. Natural, archaeological, ethnographic, historical monuments and sites.
2. Botanical and zoological gardens, aquaria and vivaria.
4. Conservation institutes and exhibition galleries permanently maintained by libraries and archive centres.
5. Nature reserves (See Appendix 1).

This definition improves on that of George Brown Goode. It clearly describes the function of museums to:

a) exhibit to the public for their enjoyment.

b) include many types of institutes such as botanical, zoological gardens and aquaria.

It means that museums exist not only for academic study for school children, scientists and curious persons, but also for the delight of the general public.

Also museums include a wide range of enjoyable facilities which keep living things and rear them.
The word "museum" comes from a *mouseion* in classical Greece (in Greek myth) which was a place of contemplation, a philosophical institution or a temple of the Muses (Lewis G. 1992a:5) who are the nine goddesses, daughters of Zeus or Jupiter (2), who protected and encouraged poetry, music, dancing, history and other branches of art and literature (Hornby, 1990:816). That is to say, originally museums meant that the places for not only philosophical discussion but also for enjoyment such as dancing or singing. After the fifteenth century, the term began to be used to describe a collection in Renaissance Florence and then it carried with it connotations of comprehensiveness and encyclopaedic knowledge (Lewis G. 1992a:5).

The ICOM definition seems to have accepted the original idea of a museum and developed it for public education and enjoyment.

(B) DEFINITIONS FROM VARIOUS COUNTRIES

The definition of a museum in each country differs slightly. According to the American Association of Museums in 1962:

"A museum is a non-profit permanent establishment, not existing primarily for the purpose of conducting temporary exhibitions, exempt from federal and state income taxes, open to the public and administered in the public interest, for the purpose of conserving and preserving, studying, interpreting, assembling, and exhibiting to the public for its instruction and enjoyment objects and specimens of educational and cultural value, including artistic, scientific (whether animate or inanimate), historical, and technological material. Museums thus defined shall include botanical

(2) They are Calliope, Clio, Euterpe, Thalia, Melpomene, Terpsichore, Erato, Polyhymnia and Urania (Matsuda T. 1984: 1455).
gardens, zoological parks, aquaria, planetaria, historical societies, and historic houses and sites which meet the requirements set forth in the preceding sentence" (Burcaw G. 1990:10).

The Canadian Museums Association officially adapted this definition with minor changes. These definitions are quite similar to that of the ICOM. It particularly emphasizes:

1. Public benefit
2. The inclusion of a wide range of institutes

The Japanese definition is shorter than the above. However it states all the basic functions of a museum in one paragraph.

A museum is an institution which collects and preserves materials concerned with history, art, anthropology, industry, natural history, and so on, and exhibits them to the general public from an educational point of view, and carries out projects needed to contribute to the public education, study and recreation, and also it researches on the materials (Museum Law 1983, quoted by Kato Y. 1984).

This definition does not mention the range of institutions exactly in the main paragraph. However if some institution follows this definition, it should be called a museum. It means that the range of museums is very wide. Also public benefit is regarded as the top priority.

Finally the English definition (adopted by MA - Museum Association) is as follows:

A museum is an institution which collects, documents, preserves, exhibits and interprets material evidence and associated information for the public benefit (Barbour S. 1992:436).
This is particularly brief and concise, but in the same publication, each element (eg.institution) is fully explored. This definition, too, complies with the significance of that from the ICOM. Especially this author feels that an important additional element of this definition is that "Museums are the servants of society".

All these definitions describe very clearly the objectives of a museum. If so, "Does each museum run its institution following these objectives?". In order to know how museums run, it is important to look into the mission statements of some museums.

(C) MUSEUM MISSION STATEMENTS

Two major UK museums have the following mission statements.

1. The Natural History Museum (NHM)
The mission of the NHM is to promote the understanding and enjoyment of the variety of our natural world through high quality exhibitions, education and science (The Natural History Museum, 1992a).

2. The National Museum of Science and Industry (The Science Museum)
The mission of this museum is to be the nation's leading centre for the public understanding of science by caring for, presenting and interpreting the national collections of science, technology and medicine (quoted by Mazda X. 1993).

These two museums clearly state their missions using a short paragraph. Needless to say, it is the primary task of the Director of a museum to define the purpose of the museum and to clarify the aims and objectives later to be expressed in tangible forms in programmes and actions (Thompson J. 1992:135).
D) REFORMULATION OF THE DEFINITION OF MUSEUM

From those definitions and the nature of mission statements, this author wants to summarize and reforms it slightly to help develop new museology. This is as follows.

A museum is a non-profit making, permanent institution which collects, preserves and researches material evidence of people and/or their environment, and exhibits them to the general public from an educational point of view, and carries out projects needed to contribute to public education, study and recreation. It includes art galleries, botanical and zoological parks, aquaria, planetaria, historic houses and sites, and others which have the above characteristics. This ultimate objective is to facilitate the peaceful coexistence between human beings and the natural world.

Firstly, this definition emphasizes a non-profit making institution which is mentioned in the ICOM definition. It means that, for instance, a museum is not like a curio exhibition for artists to sell objects. Secondly, the description, material evidence of people and their environment (ICOM definition) adequately includes the whole range of museum research. So, the definition needs not describe each subject such as history or art. Thirdly it might be a good idea to describe some institutions which belong to museums in the main paragraph such as botanical and zoological parks, since such institutions arguably could be readily forgotten.

However, the author eliminated the term "communication" from the ICOM definition. The reason is as follows. Of course, communication is a vital task for museums. For instance, the Museum Association Policy Statement presented to the conference in Glasgow (1990) stated that museums should be assessed in three
new areas: curation, operation and communication (Hooper-Greenhill, 1991a:8). However, museums communicate in a number of different ways such as educational exhibitions, publicity and marketing. The term "communication" is a complex word and concept for museum staff. Therefore if the definition uses two technical terms, communication and education, at the same level, it might confuse the reader. Within the functions of communication, the most obvious method is educational exhibitions and activities (Hooper-Greenhill, 1991a:8). That is why this author wants to use the word "education" as representative of communication in his definition. All these main terms in the definitions are compared with each other in Appendix 2.

In addition, this author accepts a planetarium as a museum with difficulty. The reason is as follows. The vital task of museums should be, in short, (1) collection, (2) education. In considering the formation of a new museum, we must then start with the collection (Owen D.E. 1988:1). A planetarium is, however, a machine which projects tiny spots of light on a domed ceiling to represent the stars and planets, and the building which houses such a projector (Burcaw G. 1990:8). This means that a planetarium might not collect any object such as old astronomical manuscripts, meteoric stones and so on. However, as a place for presenting the results of research into people's environments (see ICOM definition), we can accept it as a sort of museum which situates on the border of the museum definition (this idea comes from Professor Tsuruta, a committee member of ICOM, on his lecture at Hosei University in Tokyo, 1988).

Finally, this author adds that the ultimate objective of museums is "to facilitate the peaceful coexistence between human beings and the natural world." This is his original idea, but basically this idea may have been a dormant element of museum philosophy, therefore he wants to bring it to light, and carry it out.
Needless to say, this author believes that museum education is the most important task, hence, throughout this thesis, this subject will be highlighted and the evidence of the subject will be evaluated from various angles.

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A 19TH CENTURY SHOW-CASE MUSEUM. THE FOSSIL FISH GALLERY OF THE NHM, LONDON IN 1923

(NILES R. S. 1988, THE DESIGN OF EDUCATIONAL EXHIBITIONS)
ROLE OF MUSEUM EDUCATION

(A) IMAGE OF MUSEUM

The nature of museums and their definition has already been discussed, and it has been determined that museums include a wide range of institutions and they exist as much as a public service as for public education and enjoyment. It has also been discovered that most museums have clear mission statements and carry out their own projects in accordance with the statements for the public. If so, the majority of museums must be not only educationally relevant for the public, but also attractive and enjoyable.

Cumming suggests that museums attracted more people than football matches in Scotland recently, according to figures released by the Scottish Tourist Board. However, he continues that "you could argue, of course, that some of them probably came in for climatic rather than museological reasons, and a lot more where admission was free" (Cumming I. 1985:71). This author thinks that Cumming's ironical conjecture is vitally important. On the other hand, some museums are really enjoyed by local residents such as Mill Green Museum, Hatfield, UK which achieved the highest satisfaction rating of any of 41 identified council services, beating local swimming and leisure centres according to the results of a random survey of almost 5000 residents (Museums Journal, 1993:10). It is necessary for museums to bear in mind the opinions of visitors and those who professionally evaluate their attitudes toward museums such as Cumming.

Strictly speaking, a popular misconception of a museum is that it is a place which collects musty objects and is gloomy. These images of museums are common.
Hudson quoted some opinions about the images of museums in his article including that "Children would rapidly become bored"; "This museum ought to be in a museum"; "Educational, but so uninspiring"; "The sooner this museum is closed down the better" (Hudson K. 1985:13). Also Burcaw suggested that museum artefacts were regarded as peacefully sleeping - a repository for curiosities of the past - mummies, dinosaurs, suits of armour, and memorials of famous people of yesterday ... and ordinary adults are very seldom shown going to museums, unless they are doing something curious or illegal or unusual (Burcaw G. 1990:171,172).

According to the report of the London Museum Consultative Committee, a negative image of museums prevailed in all age groups. Words such as boring, musty, gloomy and stuffy were predominant. The atmosphere was linked to that of a church or library (Trevelyan 1991:55). Also the images of art galleries are "stand miles away; uptight; high brow; middle class; boring" (Fisher 1990:39).

These data mentioned above suggest that museums must not only listen to successful examples, but they must make an effort to solve such problems actively. The cause of such negative images comes from either lack of an education policy or merely a nominal policy. If so, it is necessary to research into the nature of museum education in general. Before discussing the range of types of museum education, this author emphasizes that museum education is not only special activities for visitors but also the display of collections has vitally important role.

(B) DEFINITION OF MUSEUM EDUCATION

Recently many books on museums have regard museum education as of indispensable importance. "The Commission on Museums for a New Century" has asserted that museums make a majority contribution to education, and also "The Humanities in
American Life”, the 1980 Report of the Commission on the Humanities, asks museums to explain more about the context of the objects they display and to share their collections to increase public access (American Association of Museums, 1984:67).

In Britain today, the educational roles of museums are being emphasized at government level, where Richard Luce, as Arts Minister, identified this area of museum work in 1989 as a priority for development during the next decade (Hooper-Greenhill E. 1991b:6). In addition, Hooper-Greenhill strongly suggests that it should not be forgotten that education is one of the prime functions of a museum and the reason for the existence of a museum (Hooper-Greenhill E. 1992a:670).

All these resources suggest that museums are now breaking from the convention and advancing toward a new museology using effective educational methods and technology. Hence it is vital to reconfirm the definition of museum education for museum staff to improve on.

a) GENERAL IDEA OF MUSEUM EDUCATION

ICOM (International Council of Museums) code describes the educational and community role of the museums in the abstract, that is:

... The museum should take every opportunity to develop its role as an educational resource used by all sections of the population.

... The museum has an important duty to attract new and wider audiences within all levels of the community, locality or group that the museum aim to serve, and should offer both the general community and specific individuals and groups within it opportunities to become actively involved in the museum and to support its aims and policies (ICOM, 1990:26).
This is a type of ethics for museums and describes how important museum education is, yet does not mention the scope of their educational role in detail.

The concept of museum education has a variety of meanings. Personally this author thinks that museum education is so wide including not only special educational activities but also exhibitions as well. Brucaw suggests "Museum people speak of their education staff; education department; and curator of education. What they refer to is their work with visiting school classes, loan exhibits to schools, and related activities, which sometimes include guided tours". Although his idea does not include exhibitions in this part of his description of museum education, when he suggested this idea to a committee to coordinate public educational opportunities, someone told him that "My definition of education did not coincide with that of the majority of the committee. Some museums prefer to use the term school services for the department (instead of education services), even though its head is called the curator of education" (Burcaw G. 1990:142). This idea suggests that even in a good museum, the term "education" is often used in its limited sense.

According to a Hooper-Greenhill's paper, the general idea of museum education can be largely divided into two types. One is that, for some people, all the activities that museums undertake have an educational purpose. Included in this would be the collection of materials, the planning and production of exhibitions, and the arrangement of special events and teaching sessions. The other type is that some people would understand "museum education" to refer only to teaching sessions and events for adults and children (Hooper-Greenhill E. 1991: 1).

Needless to say, the term "education" for museums must include a very wide meaning if museums fit the ICOM definition.
b) FLEXIBILITY OF MUSEUM EDUCATION

"Education in museums must be flexible and adaptable, requiring many skills" (Moffat H. 1992:5), and "is lifelong, active, lively, participative and innovative, and also it is based on the collections, the sites and the professional work of museums, especially the education role of the museums must includes displays which communicate effectively with identified target audiences (Hooper-Greenhill E. 1992c:6,7). Hooper-Greenhill also suggests that the nature of museum education is influenced by many factors: firstly, the collections of any museum being largely unique. Secondly, a vast range of different people, including pre-school toddlers, students...families and the elderly, as audiences. Thirdly, the methods used for educational experiences including exhibitions, drama, object-handling sessions, demonstrations, lectures, talks and many more (Hooper-Greenhill E. 1992c:6). Each educator, also curator, must carefully choose the methods of education to carry out the role of museum education which is needed by each audience.

c) TYPES OF MUSEUM EDUCATION

There is no doubt that the face of a museum is its exhibitions. In other words, building visitor’s interest depends upon how museums exhibit their collections to have an educational effect. This author discusses and examines this matter later on, as a main research focus, and in this section, he discusses so-called museum education services which are closely concerned with museum exhibits. All the following ideas of museum education services have been used by a large majority of museums. In addition, these methods listed below come from many resources, especially AIM (Association of Independent Museums - UK) Guideline No.6, Education in Independent Museums (Carter P.G.1984:10-43), and others, and were combined and summarized and added to by this author.
INDIRECT SERVICES

They are types of museum education services by which the museum staff do not educate visitors or general public directly but prepare printed materials instead which is the simplest and most basic form of museum education services.

FOR CHILDREN

1. WORKSHEET
To stimulate visiting pupils to observe closely and ask questions about the objects which are exhibited in the museum.

2. WORKBOOK
Occasionally the worksheet idea is expanded to produce a museum workbook. These are often beautifully illustrated in detail and describe a limited amount of information including questions.

3. CHILDREN'S GUIDE
This is prepared especially for young museum visitors. Such a guide has to be illustrated in detail and needs to concentrate on communicating simple information relating to the museum artefacts.

4. OTHER PUBLICATIONS
Any museum can extend the range of educational publications available in its souvenir shop. For example: identification books and background books on items within the collections; colouring books; cut-out card models; pictures; posters; jigsaw puzzles and games.

FOR TEACHER

1. PRACTICAL GUIDANCE
All the practical information which is required in order to make a trouble free visit by the school.

2. SITE INFORMATION

It describes the background information on the museum and its collection, and also suggests a selection of appropriate themes for visiting school groups.

3. INFORMATION ON ACTIVITIES

This gives teachers advice on possible activities which the children can pursue in the course of their visit.

FOR THE GENERAL PUBLIC

Children’s worksheets; teachers’ materials which are carefully thought out; and background history of the museum collections for the benefit of the teachers can be very useful for the general public as well. In addition, newsletters which describe information about the museum, its services and current events (Ambrose T. 1986:59) can be helpful for the general public.

DIRECT SERVICES

They are types of education services by which the museum staff educate visitors or the general public directly. Some examples are as follows.

FOR CHILDREN

1. GUIDED TOUR

A good tour can bring children into very close contact with museum exhibits and stimulate a high level of participation.

2. ILLUSTRATED LECTURE
Such a museum lecture is divided into two categories. One is the general introduction to the collection explaining to the children the types of objects. Another is usually on a theme selected as particularly appropriate to the museum collection. They might also be backed by appropriate films or slide tape programmes.

3. HANDLING SESSION
   This brings the pupils into the closest possible contact with museum objects.

4. DRAMA AND ROLE PLAY
   This is more commonly used in historic environments where children can be clothed in appropriate costumes and asked to play out a part.

5. HOLIDAY ACTIVITIES
   There is a great variety of these types of activities such as nature observation and making film.

FOR TEACHERS
   These types of service are seldom offered alone. They are usually provided in conjunction with either an indirect service to teachers or with a direct service for school children. However visiting a teacher's centre in a museum may prove to be a very valuable first contact point.

FOR THE GENERAL PUBLIC

1. CLUB
   There are many types of clubs, for example, "flora research clubs" and "history research clubs".

2. HOLIDAY ACTIVITIES
"Art" and "craft work" are popular. Some of them accept family groups.

3. **ADULT EDUCATION**

1) Special lecture or film show
2) Handling session
3) Adult activities for example:
   - botanical and zoological illustration, bee keeping, microscopy, bird watching, computer, folk dance, embroidery, basketry, pottery, wood sculpture.

4. **GALLERY TALK**

Large museums offer sessions for the general public who attend a special learning course related to the museum exhibits. Also guided tours by professional guides are often available in large museums.

**SERVICES FOR SPECIFIC GROUPS**

**FOR THE SPECIALIST**

There are a wide variety of specialist groups such as artists, scientists and research fellows. These services might include publishing books for specialists, library services, invitations to suitable conferences and joint researches.

**FOR PRE-SCHOOL PLAYGROUPS**

Local playgroups for the under five's sometimes look for destinations to which to take their children. Museums can provide for this need.

**FOR ETHNIC MINORITIES**

Museums with foreign objects can provide very worthwhile activities for
educational groups from ethnic minorities. Such objects should provide links between such groups and their own cultural heritage.

FOR THE HANDICAPPED
Many museums have made good efforts to make their objects accessible to the physically and mentally handicapped. For groups of blind visitors, it is vital to provide a simulating range of objects which can be touched and handled.

FOR FOREIGN SCHOOL CHILDREN
Multi-lingual captions and foreign language educational materials can be provided.

FOR FAMILY GROUPS
Museums must provide some family activities. Also discovery rooms are very popular for families with children (White J. 1990:7).

SPECIAL OUTREACH SERVICES
Museum outreach includes an enormous number of activities and approaches for the community education. Within them, the following activities can be vitally important.

LOAN SERVICES
To loan out museum objects to other institutions for exhibitions, or to loan out special objects, which are provided as educational resources, to other institutions such as schools.

MOBILE EXHIBITION
To display objects, which are not easily damaged, on a bus for local people.

**ITINERANT EXHIBITION**

To exhibit museum objects in external institutions such as community centres.

These educational methods must be carefully selected for each specific museum, and should be combined some of them to enhance their educational effect. In addition, an evaluation of the implementation of education policy needs to be conducted.

**(C) MUSEUM EDUCATION POLICY**

From previous studies on education services in this thesis, it can be said that to establish a museum education policy is vitally important. The book "Writing a Museum Policy" (Hooper-Greenhill E. 1991c:14,15) suggests many important education policies. This author chose some important policies from them and added his ideas. They are as follows:

**STAFF**

1. **DIRECTOR**
   
   S/he must prepare an educational museum mission statement.

2. **RECRUITMENT**
   
   All staff should be sympathetic to the museum educational role. Some of the staff must have relevant educational qualifications.

3. **MANAGEMENT STRUCTURE**
   
   Head of museum education services should be at the same level as the head of the curator’s department.
4. CONSULTATION

All museum staff should cooperate with education staff to implement educational ideas.

DISPLAY

The method, which includes visual, audio and writing means, must be accessible for as many age and ability groups as possible.

LIAISON FOR RESEARCH

Museums should liaise with external institutions such as higher education institutions about shared projects.

VISITORS

1. Visitors should be consulted about their educational preferences in museums and invited to evaluate displays and educational programmes.
2. Organised activities should be suitable for all ages and abilities.
3. Museums should prepare enough space for educational activities such as study rooms.
4. Self-guided learning and access to some reference materials should be possible.

Now, it can be important to study the historical improvements in museum education before moving to research into existing museum education in general and problematic issues concerning museum education strategy.
It is important to ascertain the history of museums and museum education in order to develop new museology for the future. Especially the ideas of psychologist and educators in terms of museology and pedagogy should be discussed. However as Bassett said in 1992 there was no comprehensive history of the growth of education in museums in either Britain or elsewhere (Bassett D. 1992:623), because this subject is a quite new field.

In addition, from a study of the definitions of a museum, it can be seen that museum education is vitally important. In other words, museums must exist for the education of the public. Consequently it is important to look into not only the history of museum education but also the history of museums themselves.

(A) ANTIQUE TO RENAISSANCE

The idea of educational use of historical material for teaching was begun by Aristotele (384-322 BC) in Ancient Greece (Lewis G. 1992:6). He taught that knowledge must be based on the direct observation of nature, that scientific theory must follow fact, and that knowledge can be categorised along logical principles (Burcaw G. 1990:18). Also in Greece, the Hellenistic Museum of Alexandria was set up. It was a centre of research and learning, and the breadth of outlook established there has remained a model for the establishment of later museums (Chadwick A. 1980:3). However after the Greeks, museums as such disappeared for hundreds of years (Burecau G. 1990:18).

Ancient Chinese were also keen to collect historical objects. It might have
started from the Shang dynasty (around from the sixteenth to the eleventh centuries BC), and Hsien T (190-220) established a room devoted to portraits of his ministers (Lewis G. 1992:7). However these objects were just for emperor’s family treasures. Similarly, Islam in the sixth century widely collected artefacts because of spread of its culture (Lewis G. 1992:6). And in Japan in the eighth century, Shoh-soh-in, a storehouse of the Tohdaiji Temple in Nara which stored the Emperor Shohmu’s treasures, was constructed and its fine contents still exist today, but not in furtherance of the museum education idea at that time.

In the early Middle Ages, Thomas Aquinas (1225-74) stated that "human cognition is stronger in regard to the sensibilia", and by sensibilia, he is referring to "sense impressions" or "data" collected through the use of the senses, in other words, the processes of human relationships to objects (Hooper-Greenhill E. 1992:671).

During Renaissance the most important method of study was reading and writing argumentative and complicated theories using lengthy prose. As a reaction to this idea, the seventeenth century philosophers and educators again emphasized "solid philosophy", the direct study of nature. Francis Bacon (1561-1626), an empiricist, was instrumental in promulgating this new approach to knowing, and John Amas Comenius (1592-1670) applied Bacon’s ideas to education (Ibid): "the first education should be of the perceptions, then of the memory, then of the understanding, then of the judgment (Calkins,1880:165-172). These ideas, Bacon and Comenius are generally acceptable to education as a whole, especially museum education.

I addition, in the fifteenth century, in Italy, many of the collections formed by the ruling houses and they were available to visitors, and in the sixteenth
In the sixteenth century in England, an exhibition or a museum was called a "cabinet", but one of the meanings of this was that of a summer house or a bower in a garden. "The garden came to signify a new sense of the possibilities inherent in a leisured and cultivated existence, life lived with a sense of style" (Hooper-Greenhill E. 1992b:126,128). Perhaps this was one of the earliest examples of environmental education through museums.

(8) THE SEVENTEENTH AND EIGHTEENTH CENTURIES

In the seventeenth century, the collections of John Tradescant (? 1570-1638), an English naturalist, were opened from 1625 to the public, especially for the education of children (Hooper-Greenhill E. 1992a:671), where he created a botanic garden and brought together a collection of rarities which contained stuffed birds and animals, and a wide variety of artefacts from different parts of the world (Lewis G. 1992b:23, Chadwick A. 1980:7). Later, this became the founding collection for the Ashmolean Museum, University of Oxford given by Elias Ashmole, a successor of those collections from John Tradescant junior, and opened to the public in 1683 (Lewis G. 1992a:10). It was the first public museum, existing for the public benefit, in the UK.

Needless to say, one of the most famous museums in the world is the British Museum, originated through Robert Harley, first Earl of Oxford (1661-1724), who formed an outstanding library of books and manuscripts. Also, Sir Hans Sloane (1660-1753), whose natural history collections originated during his stay in Jamaica, was to become the other founding collector of the British Museum.
Early education services to the public in the British Museum were really in the form of lip-service to the ideal (Hooper-Greenhill E. 1992a:672), however Marjorie Caygill emphasizes that "the British Museum has the distinction of being the first national, public, and secular museum in the world" (Caygill M. 1985:3). Other collections, the Ashmolean in Oxford and the Louvre in Paris, were earlier, but the British Museum was the only institution open to the public and for all studious and curious persons (Ibid).

As previously stated, at the end of the eighteenth century, the Louvre in Paris was the first free public museum, set up for the public benefit and established as part of the state education system. Cheap catalogues were produced, written for the visitor and translated into several languages (Hooper-Greenhill E. 1992a:671). Also in England, the museums that were established at around the turn of the century by both Mechanics Institutes and Literacy and Philosophical Societies had specific educational objectives. They were seen as one of the various forms of provision for adult education (Hooper-Greenhill E. 1991b:11).

The history of museums in the USA is relatively new. The first public museum in the USA was founded at Charleston, S.C. in 1773, and it remains in operation today. Also in 1785, Charles Wilson Peale, a portrait painter of renown, had an art gallery in his home and showed visitors his artefacts such as shells, minerals, and mounted birds, which formed the basic for the Peale Museum in Philadelphia (Glaser J. 1986:7.8).

However if we think about the history of museums in the USA, it is vital to look into the Smithsonian Institution, established in 1846. James Smithson (1765-1829), whose money established the Smithsonian, was the illegitimate son of the Duke of Northumberland and Elizabeth Maice. The Institution is an enormous and complex organization. The Smithsonian museums include: the National Museum of
Natural History; the National Air and Space Museum; the Freer Gallery of Art; the Hirshhorn Museum and Sculpture Garden; and the National Museum of American History. Especially, in the technology galleries, the ways technologies were used is demonstrated and explained through graphics, real exhibits, audio-visual presentations and interactive displays (Butler S. 1992:51).

(C) NINETEENTH CENTURY

During the nineteenth century in the UK, small collections were established in schools, and also Mechanics Institutions created small museums as an integral part of their educational work. In addition the "object-lesson" was a major feature of schooling following child-centred theories of Rousseau, Pestalozzi and Froebel, who inherited the earlier ideas of Bacon and Comenius (Hooper-Greenhill E. 1992a:672).

In this century, one of the noteworthy education services in the UK was a school loan service. The first loan service in the UK was in fact established by Henry Higgins, first President of the Museum Association in 1884 (Hooper-Greenhill E. 1991b:29). Also the most notable event for museums in the UK in this century was the Great Exhibition of 1851, which helped establish the Science Museum in London. The displays embodied Victorian ideas of progress, and they suggested needs for improvement of technical or scientific education (Butler S. 1992:19).

The question of labelling and interpretation was generally also under debate at this time in the UK and one of the ideas was that a public museum should as far as possible be self-explanatory without the aid of a guide book (Lewis G.1992b:31). In addition, in the 1880s, a list of "useful rules to keep in mind on visiting a museum" was drawn up to help the visitors (Hooper-Greenhill E. 1991b:16,17). Some of these, concerned with sensory perception, are as follows:
1) "Avoid attempting to see too much".

2) "Remember that one specimen or one article well seen is better than a score of specimens casually inspected".

3) "Remember there is something new to see every time you go".

4) "See slowly, observe closely, and think much upon what you see".

(Ibid)

In spite of the new movement towards better museum education, the British Museum (Natural History Museum), London, which opened to the public in 1881, had many problems in terms of educational exhibition. Miles states that exhibitions that arose from the early planning of the museum must have presented the lay visitor with a puzzling arrangement of objects, each carefully placed beyond his reach, with a label in a language he could barely understand (Miles R. 1988:3).

However it is true that the method of educational exhibition has been improving globally. In the USA, due both to the massive immigration from Europe and to the Industrial Revolution, major changes to museums were marked. Not only was there a growth of new museums, but attitudes changed and museums opened their doors to the public - the educational nature of museums took on greater importance (Glaser J.R.1986:8).

In Japan, in 1871, a museum to encourage industry and the development of natural resources was opened. These collections formed the basis of the Tokyo National Museum and the National Science Museum in Tokyo. This latter museum had a strong educational bias when it opened to the public in 1877 (Lewis G.1992a:15).

(D) TWENTIETH CENTURY

In the first half of this century in the UK, "the development of educational
services in museums has been sporadic and haphazard" (Hooper-Greenhill E. 1992a: 673). There are various reasons suggested as to why this was the case. These include two World Wars and the severe economic depression of the 1930s (Lewis G. 1992b:33). However there is the evidence that "by the beginning of the 1930s, the educational establishment was at last beginning to take notice of museum education. With the encouragement of the Standing Commission, the Board of Education published some guidelines" (Hooper-Greenhill E. 1991b:40) that is "Museums and the schools; Memorandum on the possibility of increased co-operation between public museums and public educational institutions" (Board of Education,1931).

Also Sir Henry Miers, the former President of the Museum Association, suggests in his report in 1928 that museums should be formed in every town, and should clearly define collecting policies, organised loan services and circulating exhibitions for educational purposes and travelling exhibitions for rural areas. He stressed the need for museums to be under a full-time qualified curator rather than a librarian as was often the case (Lewis G.1992b:34).

Another notable idealist of educational exhibitions was Henry Lyons, former Director of the Science Museum in London. Importantly, Lyons recognized that the most important visitor was the non-specialist who probably had very little knowledge of science and engineering, and he opened the children's gallery in 1931. Also he was keen to encourage temporary displays (Butler S.1992:29-30), which were planned to open for the short term such as loan exhibitions, travelling exhibitions and seasonal exhibitions.

Outside the UK, one of the notable educational exhibitions is the Palais de la Decouverte which was established as an offshoot of an international exhibition in 1937. Lectures, films, outreach programs and laboratory facilities were also
offered to visitors (Butler S. 1992:45). In addition, the Deutsches Museum, Munich in Germany, which formally opened to the public in 1925, is one of the most influential museums of technology in the world (Ibid:48).

After the Second World War, the need for educational services in museums has increased. In the UK, for six years during the 1950s, the BBC screened its highly successful quiz program, "Animal, Vegetable or Mineral?" in which different museums challenged a panel of experts to identify objects from their collections (Lewis G. 1992b:37).

By the 1960s, the character of museums began to change in several significant ways. Concerning science museums, Butler suggests that firstly, exhibitions were becoming less the responsibility of individual curators and more the product of team efforts involving designers, and secondly, the exhibitions themselves have become less to do with objects and more to do with subjects or themes (Butler S. 1992:32,33).

Also, Frank Oppenheimer's contribution to the development of educational exhibitions is significant. After the Second World War, although he was blacklisted for his political views following his work on the Manhattan Project, which developed the atomic bomb which devastated Hiroshima and Nagasaki in Japan in 1945, he began to work in the University of London in 1965, and visited many science museums throughout Europe, and in 1968 he published "A Rationale for a Science Museum" incorporating the psychology of perception. He went on to outline five main sections based on hearing, vision, taste and smell, tactile sensations including perception of hot and cold. His idea was realized in the Exploratorium in San Francisco in 1969 (Ibid:90).

In addition, the Ontario Science Center, opened in 1969, Toronto, Canada, runs
highly educational projects. "A number of basic principles were agreed at the outset: visitors should be able to touch as many exhibitions as possible, and exhibits should arouse the curiosity of the visitor" (Ibid:85).

Recently, visitor surveys have been seen as vital for running museums effectively. Hence many psychologists research into museology like Richard Gregory, who is a psychologist of international reputation whose writings on visual perception have become well known such as "Illusions in Art and Nature" in 1973. Also Roger Miles, in the Natural History Museum in London, the author of "The Design of Educational Exhibits" in 1982, now, a world famous adviser on educational exhibitions. He and Gregory designed the section on perception of the Human Biology Gallery in the Natural History Museum, London in the 1970s (Ibid: 90-91). In the USA, the "Center for Social Design" in Jacksonville State University runs Visitor Studies Conference regularly to enhance visitors' interest in the museums.

Another new movement of the museum world is to conserve not only so-called museum objects but also "cultural heritage" and "natural world", such as open-air museums like Ironbridge Museums, Telford, UK, or "ecomuseums" in France, which include culture and the natural world. Especially ecology galleries ask visitors how to save the earth through exhibits like the Natural History Museum in London.

This section has looked into the history of museums and museum education from ancient times to the present day. Throughout this, there are some useful points to improve museum education services, like Aristotle, Francis Bacon, Comenius, Oppenheimer and others. However there are still many old-fashioned museums which seem to give no thought for the needs of educational exhibits. Those problematic issues on museum education will be discussed in the next section.
In this final section of this chapter, some examples of the role of museum education and projects in the UK will be looked into in order to grasp recent general trends in museum education services. Also some problems concerning museum education will be examined using the relevant literature and interviews undertaken by this author. The main objective in this section is to discover some good ideas to solve these problems in order to improve the value and popularity of museums.

(A) EXAMPLES OF ROLE OF MUSEUM EDUCATION AND PROJECTS

a) THE BRITISH MUSEUM

The British Museum is the largest in the UK, concerned with cultural history from prehistoric times to the present day (Press and Public Relations Office, ND :1). It has received public funding since 1762, and today receives over 13 million pounds per year (Reeve J. 1988:65). Its education service often undertakes the task of teaching the staff of other museums. This mission statement states:

"the British Museum Education Service aims to make the museum more accessible for specific groups, as well as providing advice and materials that contribute to a better experience for all visitors."

(British Museum Education Service, ND:1)

Needless to say, these educational activities are planned for all the public, such as "holiday events" and "family days" for families; "touch exhibitions" for
disabled people; "study days" for sixth formers and GCSE students (junior and senior high school level in Japan and US) - over 2000 students a year; "adult education" including teaching in the galleries; slide lectures and films - 50,000 adults a year; "further and higher education" for museum studies students at undergraduate and postgraduate level, especially from the Institute of Education, University of London.

Extensive resources for schools include video, teachers' packs, worksheets and trails for children and students - 50-60,000 school children visit the museum annually in pre-booked groups. The Education Service also provides educational advice to staff of the museum management and curators, and contributes to the design of all exhibitions and galleries, and organises educational travelling exhibitions (Ibid).

In addition, recently the Japanese arts have been getting popular. For Japanese exhibitions the education service in the British Museum invariably organises teachers evenings with the Japan Information Centre (The Education Section of the Embassy, which produces the very useful Japan Education Journal and organises workshops all over the country), and there is now a network of teachers in schools and colleges, who take part in such events (Reeve J. 1987: 27).

b) THE SCIENCE MUSEUM IN LONDON

The Science Museum, London, at the heart of the National Museum of Science and Industry, is a unique institution. Its collections record an event of outstanding importance in human history, that is the emergence of the first industrial society made possible by the blossoming of science and technology (Cossens N. 1988:1).
The Education Unit provides a service for over 250,000 educational visitors each year in more than 5000 groups. The Education Unit supports the teachers of these groups by providing resources, teachers' courses and INSET sessions. It also runs the three interactive areas in the Museum: "Launch Pad", "Flight Lab" and "Food for Thought". As part of this work, this unit runs a series of demonstrations for all visitors (see Appendix 3). Especially "Guide to Galleries and Themes" has been prepared to help teachers select and locate, amongst the many thousands of items displayed in the museum, the ones which are of particular interest to them and their students (Science Museum Education Service, ND:2).

A recent successful educational event was "Robotics Japan" in 1991 as part of the Japanese Festival. Japan has become famous for its use of robots and they are utilized in a wide variety of contexts. More than twenty industrial and domestic robots were displayed and visitors to the exhibition could see the robot engaged in such activities as climbing a wall with the aid of suction pads; accurately putting golf balls into variously placed holes; precision welding using carbon dioxide lasers (Japan Festival, 1991).

c) THE NATURAL HISTORY MUSEUM (NHM)

The Natural History Museum (NHM) - the home of the national collections of living and fossil plants and animals, minerals, rocks and meteorites - first opened to the public in 1881. Today, the museum is one of the most popular museums in the UK, housing over 67 million specimens. In 1979, for example, almost 2.8 million people visited the public galleries (British Museum - Natural History, 1987:section 1,2; The Natural History Museum, 1992a:2; 1992b:42). The key objective of education is "to complete the development of an educational programme tailored to the needs of the National Curriculum (1) and stimulate
interest in natural history" (The Natural History Museum, 1992a:4).

This museum is a resource for pupils of all ages and abilities. Permanent exhibitions include "Story of the earth"; "Time in the rocks"; and "Treasures of the earth" in the Earth Galleries, and "Creepy-crawlies"; "Discovering mammals"; "Ecology"; and "Human biology" in the life galleries (The Natural History Museum, NDc:1), (NOTE ND: no date given). The Discovery Centre is a "hands-on" natural history exhibition especially designed for years 4, 5 and 6. Staff in the Centre guide and encourage observation and experimentation, posing questions to stimulate discussion (The Natural History Museum, ND1).

Also the Natural History Museum Teachers' Centre offers valuable services to any teacher who:

- is bringing a group to the museum;
- needs to know what resources are available for teaching earth and life science topics; and
- wants to consult a good, up-to-date resource library concerning the earth and life sciences (The Natural History Museum, ND2).

In 1990-91, the schools service dealt with 220,000 children who visited in organised school parties. Adult education has also expanded during that year. 20 evening and day lecture courses were run, giving a total of 3500 student lectures; 21 field study tours took place with a total of 1,200 student field days. In addition, the travelling discovery centre continued its full and successful schedule across the country (The Natural History Museum, 1992a:9).

(1) These programmes of museum education for pupils follow the National Curriculum for England and Wales. The Natural Curriculum in England and
Wales is a framework for the school curriculum defined by law, the Education Reform Act in 1988. It is made up of core and other foundation subjects which all pupils must study from 5 to 16 years of age. The core subjects are: science; mathematics; English; and other foundation subjects are: technology; geography; history; art; music; physical education and modern foreign languages (11-16 years olds). The NCC (National Curriculum Council) provided "a guide of the National Curriculum for staff of museums, galleries, historic houses and sites" (NCC 1990:2).

(b) PROBLEMS CONCERNING MUSEUM EDUCATION

In spite of the efforts of museum education units or departments, there are still many serious problems which reduce the popularity of museums. These are caused not only by funding problems but for a variety of reasons which arguably might come from inappropriate concepts or ideas of museum education.

a) POLICY PROBLEMS

According to the panel discussion by John Reeve, Head of the Education Department, the British Museum in London, some of the main policy problems in running the Education Service for a museum in the 1990s seem to be in:

1. "deciding how much staff time should be devoted to live teaching as opposed to the production of resources",
2. "balancing the demands of adults and families, and those of schools and teachers",
3. "deciding how much staff time and energy should go into contributing to the preparation of exhibitions and galleries".

(Reeve J. 1990:1)

"1" can be a function of funding. When this author attended the museum
education conference for the "Japanese festival" in 1991, he asked John Reeve why all conferees except Reeve and the author were women. He suggested that "education services are still regarded as unimportant jobs". Of course those women are all excellent, but men seem reluctant to take on such careers. In addition, the budget for education sections tends to be less than for other sections.

"Z" is concerned not only with educational activities but also with exhibition policy if interpreted broadly. Except exhibitions for special purposes like museums for children, touch exhibitions for disabled visitors and professional exhibitions for specialists, general exhibitions for people generally seem to be difficult to make all the visitors understand. Robert M Bloomfield, Exhibition Research and Design Manager in the NHM, London, speaking of the Ecology Exhibition, suggests that it is impossible to make all visitor understand all the concepts portrayed. So the staff decided that the minimum target age for the exhibition is 16 (this author's interview, Jan 1993 in the NHM).

"3" can be also not only the problem of the shortage of staff, but importantly how educators incorporate their ideas into the exhibitions. In some large museums, curators' ideas differ much from educators' in terms of their views on exhibitions. It is one of the most serious problems.

In addition, John Reeve emphasizes that the visitor profile of the British Museum still shows a marked absence of British working class families. There are still many fewer school children visiting the museum than for example the NHM. Many of the collections are very difficult for teachers, children, families and tourists to relate to without background information and help (Reeve J. 1990:4).
b) MISUNDERSTANDING OF MUSEUM EDUCATION

What is museum education? This author has already discussed this in this chapter,[2] (see pp13-24). It can be divided into two: direct and indirect education services; and educational exhibitions. However many museums still see the educational activities as more important than the planning of educational exhibitions.

This author emphasises that the most important role of museum education is to create educational exhibitions and some other museum education services should be of a lower priority. The reason is that most of the images of museums (see p13) come from not educational activities but exhibitions themselves, because the purpose of the majority of museum visitors is to see some exhibition, for example the number of visitors in the British Museum in 1991 was 5410,422, and only 2 percent of all visitors attended for educational activities or school groups using educational resources such as video, work sheets and trails (Press and Public Relations Office, ND:2, British Museum Education Service, ND:1). Consequently museums must create effective educational exhibitions, and these exhibitions also can reduce the burden on education staff for live teaching in galleries. This matter was discussed in the nineteenth century (see pp29-30).

However, even the British Museum for example still runs old-fashioned exhibitions such as the Mummy Gallery using small labels with small letters near the floor. Naturally the mummies themselves can attract many children and even adults without intelligible information on them. However the more these exhibitions are displayed using the method of educational exhibition, the more visitors can be attracted and educated. Also in the Science Museum in London, some galleries are very old-fashioned such as the medical history gallery. One of the typical examples is the Pitt Rivers Museum in Oxford, one of the world’s
great ethnographic collections (Museums and galleries Commission, 1993:41), (see also the cover page of Chapter 4, p137). In this museum, there are many glass-case displays and no directions to see them. All these museums run excellent educational activities. But museums exist for not only educational activities but most importantly for educational exhibitions. If a museum is not aware of this, its popularity will suffer.

In this chapter, museum education in general through a historical analysis has been looked into in order to give a background to the main research focus that is "environmental education through museums". It is vitally important to define some technical terms and examine some examples of museum education, because they must be used the main research. Firstly the term "museum" has been defined, secondly the role of museum education in general has been examined, thirdly in order to pick up some useful ideas from the past, the history of museums and museum education has been studied, and in the last part, some examples of the actual condition of museum education and problematic issues have been investigated.

In the next chapter, an historical analysis of environmental education will be undertaken in order to help structure the main case study.
CHAPTER 2

HISTORICAL ANALYSIS

[2]

ENVIRONMENTAL EDUCATION

CLEANING OUT A POND BY PRIMARY SCHOOL PUPILS IN THE UK, 1992
(ENVIRONMENTAL EDUCATION IN THE COUNTY OF KENT, SUMMER 1992)
In this chapter, environmental education in general and specifically through museums will be considered. First of all, certain terms concerning environmental issues will be defined and their historical background will be looked into.

[1] ENVIRONMENTAL ISSUES

Nowadays there are many worldwide environmental issues related to the destruction of nature. Some serious problems already arose during the industrial revolution, because coal fires and factory chimneys began to pour an obnoxious mixture of smoke into the air (Carwardine M. 1990:21). After the Second World War, industrialization became more widespread. These problems became global. Scientific research into these fields has been necessary as governments, and also many nongovernmental organisations (NGOs) have been organised to have a role in solving these serious issues.

(a) ENVIRONMENTAL ISSUES ON THE INCREASE

a) GREENHOUSE EFFECT

This effect is produced by the accumulation of carbon dioxide crystals, methane, CFCs, ground-level ozone, nitrous oxide and water vapour in the upper atmosphere, which insulates the earth and raises the atmospheric temperature by preventing heat loss (Collin P.H. 1992:101, Carwardine M. 1990:32). Human activities change the delicate mix of gases in the atmosphere, with the result that the average global temperature has increased already by some 0.5°C since 1850 (Carwardine M. 1990:31). In 1860, worldwide annual emission of CO2 from industrial sources was under 1 billion metric tons, but just after the Second
World War, it reached 5 billion metric tons, and it has increased 3.6 times since 1950 (The World Resources Institute 1992:5). If this pollution goes on growing at the present rate, by 2020, the average global temperature will have increased by 1.0°C since 1990 (Wright D.1992:21).

The greenhouse effect comes from a variety of human activities such as:

1. **The generation of electricity**: Most of the electricity we use is produced by the burning of fossil fuels which give off carbon dioxide.

2. **Cars**: They have carbon dioxide and nitrogen oxide in their exhaust fumes.

3. **CFCs (Chlorofluorocarbons)**: They are also greenhouse gases. Aerosols; foam plastic fast-food containers; padding from cushions and cars; coolants from fridges and air conditioners all contain CFCs.

4. **Dumping rubbish**: It is from household rubbish which gets buried in landfill, then methane is released into the air.

5. **Destroying rainforests**: Forests absorb millions of tons of CO2 a year. To cut the trees down at the same time increases the amount of CO2 since it have ever been absorbed by the trees. To make matters worse, when the forests are burnt, the fire releases CO2 which adds to the greenhouse effect (Bronze L. et al, 1990:18).

b) ACID RAIN

Acid rain which contains a higher level of acid (ph 4.5 to 2.5) than normal (ph 6.5) is mainly caused by sulphur dioxide, nitrogen oxide and other pollutants which are released into the atmosphere when fossil fuels containing sulphur are burnt (Collin P.H. 1992:2, Jones G. et al, 1990:3).

The problems really started when coal fires began to pour into the air a noxious mixture of smoke and gases. In 1952, in London, for nearly a week the city was
smothered in a stinking sulphurous cloud and finally it killed 4,000 people (Carwardine M. 1990:21).

Acid rain is literally eating away at our earth, destroying woods, forests, soil, even historic buildings. It is also polluting rivers, lakes (Bronze L. et al, 1990:36), resulting in fewer fish - so fewer fish-eating birds survive. The most serious areas attacking by acid rain are the east coast of USA and around Denmark. However other areas attacking by acid rain are the eastern seaboard of the USA and Canada, nearly all of Europe, and Hong Kong. Also some other developing countries could have this problem in the future such as Venezuela, around Uruguay, the countries facing the Gulf of Guinea, South Africa and the western parts of Malaysia and Indonesia (Wright D. 1992:18).

c) OZONE LAYER DEPLETION

Between 20 and 50 Km above the surface of the earth, the ozone layer exists. It is created by the effect of UV (ultraviolet) radiation from the sun on oxygen. It is now being destroyed by reaction especially with chlorine compounds (from CFCs - chlorofluorocarbons - used in aerosols and packing), (see also p44). The destruction or reduction of the layer has the effect of allowing more radiation to pass through the atmosphere with harmful effects on the natural world (Collin P. 1992:37,155).

For example, a depletion of just 1% of the ozone layer causes a 2% increase in the incidence of skin cancers; worldwide, more than 100,000 people are already dying from predominantly UV-induced skin cancers every year; a higher dose of UV may slow down plant photosynthesis; too much UV radiation tends to disorientate planktons in the sea, causing them to die and it would affect the entire ocean ecosystem (Carwardine M.1990:29).
On the other hand, ironically enough, ground-level ozone has increased by more than 60% in Europe and North America since the 1920s. It creates a photochemical smog, which chokes cities (Ibid:27).

CFCs, which cause ozone depletion in the stratosphere, are classified by numbers: CFC-10 is used in aerosols; CFC-11 is used to make plastic foam; CFC-12 is a coolant for refrigerators; CFC-13 is the cleaning substance used in the electronics industry (Collin P. 1992:40).

Recent measurements indicate that peak ozone destruction has reached 60% over Antarctica and about 6% in the mid-latitudes (The World Resources Institute, 1992:9). If we now stop using CFCs, the CFCs which we have already emitted into the atmosphere will reach the stratosphere in 7 years time (Collin P. 1992:40).

\section*{d) DESTRUCTION OF HABITATS AND WILDLIFE}

Habitats, the natural home of groups of plants and animals (Spurgeon R. 1988:5) and wildlife, wild animals and birds (Collin P. 1992:233), are now being destroyed at a threatening rate.

Firstly, disappearing tropical rainforests, which grow in areas where rainfall and temperatures are both high and constant, is a classic example. Great rainforests stretch around the equator and are the most complex ecosystems (habitat and community – the group of plants and animals) in the world, and contain a wealth of resources (Spurgeon R. 1988:5,26).

In the 1940s, 15% of the earth’s land surface was covered in tropical rainforest, however today less than half of it is left. According to FAO’s (The United Nations Food and Agriculture Organisation) research, about 100,000 square kilometres of rainforests is cleared completely every year (Carwardine...
Especially, most of the rainforests in Central America, East Coast of Brazil, Central Africa and South East Asia have disappeared (Wright D. 1992: 15).

Tropical rainforests are richer in species than any other terrestrial habitats. They contain at least 50% and perhaps 90% of the world’s species (The World Resources Institute, 1992:130), and also play a vital role in regulating the world’s climate, through their position in the oxygen, carbon and water cycles (Spurgeon R. 1988:27).

Secondly, hunting, poaching and the wildlife trade are large and big problematic issues. The late 19th and 20th centuries have seen a wave of extinctions and population declines perhaps unprecedented in the history of the world. International trade in wildlife is worth about US$ 5 billion a year and involves thousands of different species (Carwardine M. 1990:86,89).

Thirdly disappearing coral reefs is another serious issue. Coral reefs are the underwater analog of tropical forests which have a greater number of species. They are now under severe pressure from a variety of threats because of overfishing, agricultural and industrial pollution; smothering by soil erosion from upstream agricultural lands and the destruction of forests; and also global climate change (The World Resources Institute, 1992:131).

Lastly, needless to say, the variety of human-related pollution destroys habitats and kills animals and plants in most parts of the world.

e) OTHER IMPORTANT ISSUES

1. WASTING OUR RESOURCES
Every year, each household in Britain, for example, creates about 1 tonne of rubbish that has to be thrown away (Bronze L. et al, 1990:20). Literally we are wasting our raw materials. To make matters worse, most of it gets dumped in huge landfill sites and it creates barren fields, including poisonous elements, and emits methane gas. Other rubbish is burned, but sometimes that releases toxic fumes. These problems come not only from throwing away rubbish but also through generating electric power using oil, gas and coal. In order to solve this problem, recycling and alternative energy, such as wind power, tidal power and solar power can be vital solutions.

2. LAND DEGRADATION

The soil of a significant portion of the world's productive lands has been degraded by human activities. Water and wind erosion, land compaction, loss of nutrients, and chemical contamination cause this problem. About 1.2 billion hectares - an area larger than India and China together representing 11% of the earth's vegetated surface - have been moderately or severely degraded since 1945 (The World Resources Institute, 1992:3). Similarly desertification, owing to intensive farming and other factors, is increasing in especially poor, arid land (Spurgeon R. 1988:34).

3. THE NUCLEAR DEBATE

A primitive uranium bomb was exploded on Hiroshima in Japan on 6 August 1945 and three days later a plutonium bomb was exploded on Nagasaki in Japan, which killed over 20,000 people immediately or within 4 months. After these incidents, there have been 1,523 nuclear test explosions. If nuclear war was to occur, all people, animals and plants, which could survive immediately after the explosions, would come in the aftermath, and would die out because of a nuclear
winter - about 200 million tonnes of soot and ash into the atmosphere and extreme darkness and cold (Carwardine M. 1990:162,164,167,168).

Similarly, some nuclear power accidents have killed and severely injured people. For example, the accident at Chernobyl, a large nuclear power station in the former Soviet Union, in 1986, killed 30 people on the spot and about 250 people suffered severe radiation injury. In addition, nuclear power produces high-level radioactive waste which can be dangerous for thousands of years (Bronze L. et al, 1990:39).

However, we must bear in mind that there are some opinions that suggest such nuclear developments might be helpful. For example, it is said that nuclear weapons may prevent the Third World War, and that nuclear power does not cause acid rain and greenhouse effect, and that nuclear power stations are relatively safe (Ibid:38). Indeed, some parts of these ideas are true, but we do know that nuclear developments have killed a lot of people, have caused cancer, and also have destroyed ecosystems of tropical islands in the Pacific Ocean because of bomb experiments.

What is more, growing population especially in the developing countries causes famine and environmental problems which this paper has already described above. The world’s total number of people in 2020 will be 8 billion although it was 1 billion in 1830 and 4 billion in 1975 (Wright D. 1992:23).

(B) SCIENTIFIC RESEARCH ON ENVIRONMENTAL ISSUES

Environmental protection is a relatively new issue for most developing countries. Their pertinent legislations stem from the late seventies, although
developed countries have a longer tradition, especially concerning pollution control (Werner G. 1992:16).

EIA (Environmental Impact Assessment) is also relatively new. It is "a method of analysis which attempts to predict the likely repercussions of a proposed major development upon the social and physical environment of the surrounding area" (Jones G. et al, 1990:148). However there are some problems of EIA in developing countries such as: lack of trained human resources; lack of financial resources; lack of information on environmental and social systems; low status of environmental departments or agencies (Bisset R. 1992:215,216). Many argued that one of the most important factors that could significantly improve the EIA process is good education. In fact currently only very few educational and training courses exist in developing countries (Biswas A.K. 1992:237).

On the other hand, in developed countries, environmental problems have become a major national concern, and there is growing public and political pressure to understand these problems and find solutions for them. The White Paper "This Common Inheritance; Britain's Environmental Strategy, in 1990" asserts, for example, that:

- there needs to be a major and growing scientific effort to understand human impacts on the environment fully, and to identify the most effective and appropriate way of intervening to protect the environment.

- much more research is needed, particularly on global issues such as the effects of human activities on the ocean and on the atmosphere.

(ACOST - Advisory Council on Science and Technology, 1991:5)

In addition, in Britain in 1981, for example, the new "Wildlife and Countryside Act" prohibited certain methods of killing or taking wild animals, and amended
the law relating to protection of certain mammals and endangered species (import and export), (London Her Majesty’s Stationery Office, 1989:1). Furthermore, the number of wildlife and plants under threat in many countries is being researched so as to protect their future (The World Resources Institute, 1992:304-308).

(C) SUPPORT OF NONGOVERNMENTAL ORGANISATIONS (NGOs) TO SOLVE ENVIRONMENTAL PROBLEMS

In the industrialized countries, many of these "Nongovernmental Organizations" (NGOs) are small and work at the community level, and also in the developing world, most of these groups are community-based as well, and are often very small or temporary groups. In spite of difficulties in managing them sometimes, NGOs are now growing, both in numbers and in influence, especially in the developing countries. The reasons for this growth are complex: for instance, local groups often form in response to specific needs such as the need to improve water supplies; national groups may form to fulfill a specific need such as environmental protection (The World Resources Institute, 1992:215). It is estimated that in excess of 12,000 NGOs now operate, ranging in size from the small natural history society to the internationally active groups (Jones G. et al, 1990:301).

NGOs are relatively new organisations. Almost all environmental NGOs and most NGO networks and umbrella groups were started in the 1980s. In the UK, The Oxford Committee for Famine Relief (Oxfam) was started in 1942 to aid starving civilians in Nazi-occupied Greece (The World Resources Institute, 1992:216,217).

"The increase in links between northern and southern NGOs has been paralleled by similar growth between NGOs and the United Nation system. The United Nation Conference on Environment and Development (UNCED) is accelerating that process"
In addition, some successful, huge NGOs, for example, are as follows:

**WORLD WIDE FUND FOR NATURE (WWF)**

Established in 1961. It works in conjunction with the "International Union for the Conservation of Nature and Natural Resources" and has been responsible for the implementation of key international laws and agreements on conservation such as "Conservation on International Trade in Endangered Species" for the creation of National Parks, and for saving nearly 30 endangered animal species such as the giant panda.

**GREENPEACE**

Founded in 1971, it has continuously made world headlines through the activity of its members who have often placed themselves in direct confrontation with governments and with industrial corporations. It has constantly argued for a ban on sealing and whaling, for the prevention of above-ground testing of nuclear devices, and for a ban on dumping nuclear waste into the oceans.

**FRIENDS OF THE EARTH (FoE)**

Operating in 28 different countries, the organisation lobbies governments and politicians, provides information for inclusion in EIA (Environmental Impact Assessments) and disseminates information through videos, lectures, and books. In recent years, it has been particularly active in resisting the construction of new nuclear plants.

(Jones G. et al, 1990:182, 204, 469)
All this fundamental knowledge of environmental issues can be indispensable to setting up a plan for environmental education. The next section will discuss environmental education in general.
This section will discuss environmental education in general from a variety of important angles. Firstly, the definition and objectives of environmental education will be looked into. Secondly the development of environmental education will be researched as a global trend, not least through the consideration of international conferences. Thirdly some approaches to environmental education will be examined, including both formal school education and adult education. Fifthly environmental education in some countries, both developed and developing will be looked into. Finally some useful examples of environmental education will be discussed from the UK and the USA.

(A) DEFINITION OF ENVIRONMENTAL EDUCATION

To begin with, a discussion of the definition of environmental education would seem a vital first step. During the past two decades, many attempts have been made to define the term "environmental education". In 1970, the International Union for the Conservation of Nature and Natural Resources, called a Conference on Environmental Education in Nevada, defined "environmental education". This is now accepted by many organisations through the world. This definition states that:

"Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision making and self-formulation of a code of behavior about issues concerning environmental quality." (Neal P. & Palmer J. editors, 1990:2)
Five years later (1975), UNESCO (United Nations Educational, Scientific and Cultural Organization) at the Belgrade Workshop, Yugoslavia, defined the objectives for environmental education following the definition of environmental education developed in Nevada in the USA. These are summarized as follows:

"1) To foster clear awareness of and concern about economic, social, political and ecological inter-dependence in urban and rural areas.
2) To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.
3) To create new patterns of behavior of individuals, groups and society as a whole towards the environment."

(Ibid:5)

This includes three particularly important words and these are "awareness", "provide" and "behaviour". Firstly lack of "awareness" of environmental issues can cause many new serious problems, because people might throw away rubbish everywhere or might not cooperate with a campaign for the protection of natural environments for example. Secondly every person needs to be "provided" sufficiently environmental knowledge to help reduce environmental damage. Thirdly every person must "behave" in a way that conserves nature using environmental knowledge effectively. This third word "behave" is the ultimate purpose of environmental education.

(B) DEVELOPMENT OF ENVIRONMENTAL EDUCATION

a) IN GENERAL

Environmental education is presumably as old as human civilization. Through the centuries, people have learned to survive in their surrounding environments
which is more powerful than human beings and at the same time how to make use of their environment. However it is no exaggeration to suggest that people have not learned how to coexist with their environments.

The initial impetus for the worldwide interest in environmental education was given by the United Nations Conference on Human Environment in Stockholm in 1972. The conference designated the 5th of June, every year, as World Environment Day by organising activities aimed at promoting environmental protection. Every year the United Nations Environmental Programme (UNEP) chooses a theme for the day. The theme for 1990, for example, was "Children and the Environment" (Vinke J. 1993:41).

In developing countries, in spite of the existence of only very few NGOs (Non Governmental Organisations), the Malayan Nature Society was already established by 1940 with the aim of promoting an interest in the conservation of wildlife and natural resources in Malaysia. The Wildlife Club of Kenya was also founded in 1968. In addition, India is one of the front-runners in environmental education in schools since it began in the 1960s, partly due to the philosophies of Buddhism and Hinduism both fostering the conservation of plants and wildlife (Ibid:42).

b) THE UK

The May 1988 Meeting of the Council of the European Community motivated the UK government to take a more positive attitude to environmental education. The meeting agreed with the following objectives and guiding principles:

OBJECTIVES
"To increase the public awareness of the problems in this field, as well as possible solutions, and to lay the foundations for a fully informed and active participation of the individual in the protection of the environment and the prudent and rational use of natural resources" (Ibid:Xii).

GUIDING PRINCIPLES
1) The environment as the common heritage of mankind.
2) The common duty of maintaining, protecting and improving the quality of the environment, as a contribution to the protection of human health and the safeguarding of the ecological balance.
3) The need for a prudent and rational utilization of natural resources.
4) The way in which each individual can contribute to the protection of the environment.

(Ibid)

Also The National Curriculum Council for England and Wales was asked by the Secretary of State for Education to consider and advise him by March 1989 on cross-curricular issues including environmental education (DES, 1989:V).

Furthermore, the movement of countryside conservation can be closely linked to environmental education. The Countryside Commission was established by the Countryside Act 1968. Its responsibilities are for the conservation of natural beauty in England and Wales, and encouraging the provision and improvement of
facilities for enjoyment of the countryside and access for open air recreation (Countryside Commission ND: cover page). A broad review of countryside policies was carried out in 1990, and the results were presented in the Environment White Paper "This Common Inheritance" and "In the First Year Report" (Department of the Environment 1992:3). Also the Department of the Environment published "Green Rights and Responsibilities - A Citizen's Guide to the Environment" in the 1990s. It includes the sections of "Local Environment"; "The Green Consumer"; and "Pollution Control". The last section discusses "visiting the countryside" asserted that:

"The Department of the Environment is responsible for policy on the protection and the development of the countryside. The Ministry of Agriculture, Fisheries and Food is responsible for agricultural policy including its environmental effects. The Forestry Commission is responsible for forestry policy and managing the public forests. The Countryside Commission advises the Government on conservation. It works with your local council, voluntary groups and individuals to protect the landscape and to improve access and recreation facilities. England Nature promotes the conservation of England's wildlife and its habitats. The National Park Authorities have special powers to protect some of our most beautiful landscape areas. Your council must take into account the protection of local habitats and landscapes when taking planning decisions."

(Department of the Environment, ND)

This book is one of the most useful resources for enhancing peoples' concern about environmental questions and crises.

c) EARTH SUMMIT '92

Finally, in recent years, the most notable conference concerning environmental
education was the United Nations Conference on Environment and Development in Rio De Janeiro, 1992, called Earth Summit '92. Some of the major achievements of the Earth Summit are:

1) Agenda 21: a comprehensive blueprint for global actions leading to sustainable development.
2) A set of principles to support the sustainable management of forestry.
3) Two legally binding conventions one aiming to prevent global climate change and the other to prevent eradication of biologically diverse species, were signed by representatives of more than 150 countries.

(Strong M. editor, 1992:9)

"both formal and non-formal education are indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns.... To be effective, environmental and development education should deal with the dynamics of both the physical, biological and socio-economic environment and human (which may include spiritual) development should be integrated in all disciplines...."

(Earth Summit'92:221)

Especially, a statement about the development of "human spirituality" is very important, since environmental damage can result from a particular morality.

(C) STRATEGIES FOR ENVIRONMENTAL EDUCATION FROM PHILOSOPHICAL VIEW POINTS

PHILOSOPHICAL APPROACHES
There are several arguments about environmentalism related to environmental education (Pepper 1984/1993, O'Riordan 1981). Definitions used by different authors differ slightly according to the ideological perspective which can create confusion for the reader. However two distinct ideologies can be commonly recognised (Job 1995). Job argues (Ibid) that these two positions can be regarded as a spectrum with "technocentric perspectives" at one end and "ecocentric perspectives" at the other. There is a close link between environmental ideology and the approach which is adopted to environmental education.

Firstly, the technocentric perspective relates to an anthropocentric view of the earth in which the earth is regarded as a life support system predominantly for the benefit of human beings. This view of the earth proposes that the mechanisms of the earth's systems can be understood through scientific investigation and that the earth can be managed sustainably through the application of science and technology. On the other hand, the ecocentric perspective emphasises that all living things including human beings and non-living things are equally vital to sustain the earth. A more detailed classifications is given in figure 2.1 below.

![Spectrum of Technocentric & Ecocentric Perspectives](image)

<table>
<thead>
<tr>
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<th>Technocentric</th>
<th>Ecocentric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earth View</strong></td>
<td>Mechanistic/Reductionist</td>
<td>Holistic/Gaianist</td>
</tr>
<tr>
<td><strong>Understanding of the Earth</strong></td>
<td>Scientific Investigation/Environmental Management</td>
<td>Scientific Investigation as well as sensory, emotional spiritual ways of knowing</td>
</tr>
<tr>
<td>RESOURCE DEPLETION &amp; POLLUTION</td>
<td>TECHNICAL SOLUTIONS</td>
<td>CHANGES IN LIFE-STYLES</td>
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<tr>
<td>DEVELOPMENT ISSUES</td>
<td>LIMITING HUMAN NUMBER/DEVELOPING INDUSTRIAL TECHNOLOGY</td>
<td>REDUCING CONSUMPTION IN RICH COUNTRIES TO ALLOW POOR COUNTRIES TO HAVE THEIR FAIR SHARE OF THE OTHER'S RESOURCES</td>
</tr>
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In addition to this, the technocentric perspective can be said to correspond with the philosophies of reductionism (complex phenomena are best understood by an analysis of components which breaks down the phenomena into their fundamental, elementary aspects - Reber S.1985:622); positivism (all knowledge is contained within the boundaries of science obtained by experiments or observations); materialism; and objectivism. This perspective relates also to quantitative analysis and hypothetico-deductive methodology (a scientific method that focuses on the deduction of hypotheses built up by the results of experiments or observations or known theories).

On the other hand, the ecocentric perspective mainly stems from Gaia theory (Note: it is a hypothesis devised by Lovelock J. in 1979; Gaia is Greek goddess of the earth), that the biosphere is like a single organism where all living things and non-living things are interrelated and is both self-regulating and self-organising (Jones G. et al,1990:186, Collin P.H.1992:94). This raises the question as to whether the harmful impacts of human activity on the earth will be corrected by self-regulating processes or whether Gaia will seek to sustain life in its broadest sense by eliminating the human species.
IMPLICATIONS OF ENVIRONMENTAL PHILOSOPHY FOR EDUCATION

Most examples of environmental education include both technocentric and ecocentric perspectives. Fien (1992) describes three approaches to environmental education which he identifies as education "about", "through" and "for" the environment, each reflecting varying degrees of technocentric and ecocentric influence.

Education "about" the environment tends to reflect a technocentric perspective. This approach was the dominant form of environmental education especially in the 1970's (O'Riordan, 1981).

Education "through" the environment is to educate students through their experiences in the environment (Fien, 1992). "A fusion of education "about" and "through" the environment is characteristic of much common practice in the UK in outdoor education" (Job 1995), as in many field study centres.

Education "for" the environment is such as the ultimate end of the environmental education from an ecocentric perspective. It is seen in terms of promoting life-styles which will lead to a more sustainable earth. Fien (1992 quoted by Job 1995) summarized these three approaches to environmental education by suggesting that education "about" and "through" the environment are valuable only if they are used to provide skills and knowledge to support education "for" the environment.

AN ECLECTIC APPROACH COMBINING TECHNOCENTRIC AND ECOCENTRIC PERSPECTIVES (EATEP)

As any methodology of education has its own weakness, these approaches also have the same problems. The weakness of a purely technocentric approach are that it denies the validity of non-quantifiable forms of knowledge and experience; hypotheses generated by the hypothetico-deductive method are often narrow; reductionism fails to deliver a holistic landscape view; and it lacks the sense
of uniqueness. On the other hand, the ecocentric approach can lead to unfocused studies in the field unless given suitable direction by teachers. These some problems might be solved by using an eclectic approach combining technocentric and ecocentric perspectives (EATEP). EATEP emphasis that in environmental education, tecnocentric perspectives must be balanced with ecocentric perspectives. Similarly affective learning is equally important to cognitive learning in order to enhance students' understanding and appreciation of the natural environment which relates to ecocentric and technocentric approaches to environmental education. In the museum world, visitors' affective as well as cognitive learning have been regarded as important objectives in recent years. Historically however, as in environmental education through museums, the emphasis tended to be cognitive learning. The EATEP model is shown schematically in figure 2.2 named "How to bite a Green Apple of Environmental Education?"

EATEP (An Eclectic Approach combining Technocentric and Ecocentric Perspectives) MODEL

"How to bite a GREEN APPLE of ENVIRONMENTAL EDUCATION?"
Environmental education in some European and Third World countries are discussed in the following sections, which comes from a Development Centre workshop organised by OECD (Organisation for Economic Co-operation and Development) in April 1992, and includes 10 case studies of educational programmes in Africa, Asia and Latin America which are designed to promote sustainable development (OECD, 1993:7)

AUSTRIA
The Project on "The Environment and School Initiatives" under the auspices of the OECD (Organisation for Economic Co-operation and Development) and CERI (Centre for Educational Research and Innovation) was aimed at school-related research and development of environmental education. Broadcasting media were the main vehicles of environmental information available to the general public. Other innovative features were recognized as essential to the effective promotion of environmental education. These included opportunities for field work; quality control of teaching materials; small class sizes; environmental education across the curriculum (Dunlop J. 1993:84).

ITALY
Recently, the Italian education system has made significant progress towards environmental issues and problems. In order to give support to teachers in this field of study, organisations such as Centro di Iniziativa Democratica Degli Insegnanti (CIDDI) have arranged both national and international seminars on the theme of environmental education. The growth of environmental education in the Italian education system suggests that the development of teaching strategies and materials support are in considerable demand (Ibid:85).

NETHERLANDS
Until the mid-1980s, environmental education in Dutch schools was tentative and haphazard. Dunlop relates that any materials were untested and used by teachers in a completely random manner. Since the mid-1980s, the National Examination System had been revised and, as a result, the three science subjects - chemistry, physics, biology - and geography now include environmental topics. However in primary schools, no systematic environmental education exists. Some teachers ventured to cover well-published global issues such as acid rain or the greenhouse effect, but such topics were either taught very superficially or badly owing to the teacher's lack of knowledge. Many Dutch NGOs try to assist schools but the quality of their educational materials does not fit schools' curricular practices. To be successful, the entire system needs to be reformed (Ibid:86,87).

NORWAY
The Ministry of Education, Research and Church Affairs aimed to make environmental education interdisciplinary in all subjects within the education system. The implementation of training programmes is the responsibility of many bodies such as County Directors of Education, County Education Committees, school boards, state Colleges of Education, adult education institutions, teachers' organisations, schools and individual teachers. One of the notable features of the Norwegian approach to environmental education is that it involves the mobilization of teachers, and seeks to find ways of helping counties, schools and teachers produce their own local plans for the environment (Ibid:87).

KENYA
The most critical environmental problem here is probably land degradation. Only one fifth of Kenya's total land is arable, but, according to the National Environment Secretariat (NES), 28.7% of this area is severely affected by desertification, or shows signs of deterioration. Also deforestation
constitutes another major problem. About 19,000 hectares of forest are destroyed each year due to clearance for firewood. As a result, almost three-quarters of the country's original natural forest has already been destroyed.

The Kenya Energy and Environment Organisation (KENGO), which was established in 1982, addresses the above problems, and functions as a national network of local group and NGOs. Since its creation, KENGO has been active in the field of environmental education, mainly in the field of tree planting and energy conservation. KENGO's efforts in the area of environmental education are complemented by educational materials, such as pamphlets, posters, a quarterly newsletter "KENGO News", a journal and technical books. Illustrated publications with simple step-by-step explanations have been very useful for various grassroots communities (Munene M. 1993:123,125,127).

MALAYSIA

Until recently, this country has relied heavily on the export of crops such as rubber, palm oil and cocoa as well as minerals like tin and iron ore. More recently, manufacturing activities such as electronics, textiles and even cars have developed. Logging is still an important industry in some states. Such trends of rapidly developing industrialization have not been friendly to the environment. Major environmental legislation was enacted in 1974 - the Environmental Quality Act (EQA) and the Pesticide Act (PA).

Formal environmental education has existed at the university level since the late 1970s and the school curricula from the mid-1980s. A major problem for environmental education is the diverse ethnic composition of the population, made up of Chinese, Malay and Tamil Indians, so four principal languages are used: English, Malay, Mandarin and Tamil. The Environmental Protection Society of Malaysia (EPSM) was established in 1974. It has advocated the prudent use of environmental resources and has paid special attention to issues connected with
policy and regulations. It has worked closely with the DOE (The Department of Environment) and NGOs to plan and conduct studies to raise the public's environmental awareness. Especially, as the method of non-formal education for adults, in the future, mass media like TV is regarded as important to achieve changes in attitudes (Gurmit Singh K. 1993:165,166,174).

BRAZIL
Depletion of the rainforests, destruction of habitats and massive air and water pollution are Brazil's present serious environmental problems. Despite the seriousness of these problems, very few resources have been available to increase the level of environmental awareness of the people. The major, most effective agencies are mass media, i.e. TV, radio, and in particular, newspapers. The Brazilian media are well-developed among developing countries. 314 registered daily newspapers and 17 news magazines are published. The contribution of the press can help people to understand the increasing process of environmental degradation seen in the country (Walter D. 1993:199-201).

All in all, through the experiences on environmental education in some countries, both formal school education and non-formal education by NGOs and mass media are indispensable in helping develop people's awareness of the environment.

(E) SOME EXAMPLES OF ENVIRONMENTAL EDUCATION FROM THE UK AND THE USA

THE UK
One of the most successful schemes of environmental education has been conducted by WWF UK (see p52). It has initiated a wide range of curriculum development and community projects using over 200 resources published by WWF for home and school to give people the skills and knowledge for learning environmental issues. During the past 10 years, WWF UK has developed an extensive,
Another typical successful schemes of environmental education might be carried out by the Institute of Education in the University of London which is the biggest postgraduate institution in the UK. In particular, the Geography 16-19 Project has produced several useful teaching publications, mainly written by geography teachers in the schools, such as "The Rural Urban Fringe"; "The Impact of Manufacturing Industry"; "London's Green Belt"; and "Human Impact on River System". Almost these resources directly concern with local environmental problems. That project's major contribution has been to focus its curriculum Framework (see Naish et al, 1987) on people - environment questions, issues and problems, and this approach has been taken on widely.

Also The Remote Sensing in Geography National Curriculum Project is based at the Institute. Through this project, teachers are encouraged to use aerial photographs, weather and other satellite images, and are given opportunities to investigate change in human and environmental geography (Kent et al, 1993).

THE USA

One of the most effective activities on environmental education in USA could be the "Earth Day". The objectives of this event are to focus on earth issues, to make people understand what they can do to look after the earth - stewardship - and to develop educational projects. In 1990, for example, the event on 20th Earth Day were arranged all over the USA and each state had a coordinator, and many organisations and firms cooperated. There were many activities which school children enjoyed without any stress. The examples are listed as follows.
1. **SCHOOLYARD ACTIVITIES**
- Plant trees in the school yard.
- Grow trees from seeds.
- Set up an organic garden at school with a compost pile.
- Survey how many different kinds of plants, animals and insects live in the school yard and draw pictures of them.
- Organise a clear-up of the school yard or a local park.

2. **RECYCLING**
- Organise a school recycling program with collection bins.
- Set up a paper recycling area in the classroom. Paper with one good side can go into a box to be reused as scratch paper. Another box should be used for non-reusable white paper and a third box for coloured paper.
- Have the students draw up and circulate a petition asking the administration to use recycled paper.

3. **ENERGY AND WATER**
- Have students use creative, non-polluting transportation methods to get to school during the week prior to Earth Day. Biking, roller skating, using a pogo stick, riding a unicycle, etc.
- Organise a toy car or boat race operating on solar energy.
- Build a solar box cooker and use it to have a cook-out.
- Adopt a local stream and protect it from pollution and development.

4. **ARTS AND CRAFTS**
- Organise an environmental picture contest, dramatizing the best (beauty) and worst (pollution) of nature.
- Make a paper tree on the classroom wall with each leaf giving a tip on how to protect the environment.
- Have students perform a play or puppet show with an environmental theme.
- Sing song about nature.
- Organize a parade of students dressed as their favorite endangered species.

5. FIELD TRIPS
- Visit a dump and a recycling centre.
- Arrange for a tour of a wind farm, a geothermal power plant or a building that uses solar energy.
- Survey what kinds of garbage washes up on an ocean beach or a lakeshore. Then organise a clean-up.
- Visit a nature centre, a natural history museum or wilderness area.
- Take a trip to a local organic farm that uses natural methods to grow food.

(Earth Day 1990)

These activities can be useful for environmental education in schools in any countries, even as museum activities.
ENVIRONMENTAL EDUCATION THROUGH MUSEUMS

Environmental education is a vast area of endeavor, and it can be taught not only within a formal school education but also less formally outside schools such as with fieldwork or especially museum education including so-called museums, zoological parks, botanical gardens, aquaria, planetaria, environmental study centres and heritage sites.

Museums are normally well resourced, through their wide range of collections, their expertise in display, their long experience in conservation, and their large numbers of visitors. They thus can play an important role in making the public aware of environmental problems, and also moving towards solutions for the latter by cooperating with scientific research institutes through the world.

(A) HISTORICAL VIEW

The ultimate aim of environmental education (in this author's view) is to conserve the natural world as well as the world's cultural heritage. Natural and cultural heritage interpretation are therefore vitally important for museums and heritage centres.

Original books on interpretation are "Rambles in Galloway" by Malcolm Harper, 1896, and "A Study in City Development" by Patrick Geddes, 1904. However it is said that modern interpretation was started in the USA by Stephen Mather, Director of their National Parks. In 1919, he lectured at Lake Tahoe and he persuaded colleagues to walk from there to the Yosemite National Park. However "it was not until 1957 that the first book on the subject was published in the..."
USA *Interpreting Our Heritage* by Freeman Tilden." It is now recognized as the classic textbook on the interpretation of the natural world (Barclay D. 1983: Introduction page).

Given this necessity of interpretation, museums needed to record the whole interpreted data not only near the museum but also for the whole surrounding district, even for the whole country. One of the original local record centres in the UK is the Natural History Recording Centre at Rotherham Museum, set up in the 1970s, in order to ease the flow of information, using a computerised system, between ecologists, naturalists and conservationists. The centre was designed to answer the question: what animals and plants are known to occur on each site, and what is the status and distribution of each species (Yeates C. 1991:28).

In the 1980s, few exhibitions had environmental issues as their focus. For example, in 1982, Merseyside Museum, Liverpool, UK, produced the exhibition "Wild life, the Law and You about the 1981 Wildlife and Countryside Act", and Woodspring Museum, Weston-Super Mare, UK, produced the exhibition "Living with Wildlife" which used the same piece of legislation (Coles A.1991:32).

The 1990s are arguably a "Green Decade" for the world of museums. Alec Coles (Tyne and Wear Museums Science) suggests that it is the norm to append a "conservation message" to display on all kinds of natural history themes (Ibid). Also Paul Howard (Yorkshire Museum) discusses the exhibition "Monsters and the Deep" and describes it as one of a series of natural history exhibitions highlighting different environmental threats. He continues that "we try to produce exhibitions which are more than just interesting. Our policy is to encourage conservation by fostering a sense of excitement about the natural world" (Howard P.1991:34).
On the other hand, as early as the middle of 1969, the AAM (American Association of Museums) was awarded a contract from the Consumer Protection and Environmental Health Service; Public Health Service; U.S. Department of Health, Education, and Welfare; to undertake the study of and to prepare a report on "Development of Museum Education Techniques for Human Ecology" (Steere W. 1971: vii). When the Environmental Committee of AAM began work on its report in 1969, only a few people understood the full meaning of the terms "ecology", "biosphere" or even "environment", but after that public awareness has developed suddenly and today these terms are household words (Oliver J. 1971:xii), (Note: The general public's level of understanding of these words will be investigated by this author in his case study. See Chapter 7).

In addition, recently the environmental impact of tourism has become an issue. According to a survey by the Countryside Commission, 72% of people in Britain, for example, prefer to spend their holidays in the beautiful countryside, and half the population visit the countryside at least 12 times a year (Hewison R. 1992:31). In 1991, a conference, concerning the 1990 British Government White Paper "This Common Inheritance" took place. The conferees came from a wide range of interested agencies including museums. This report says that "the relationship between tourism and the environment must be sustainable in the long term. Tourism must not be allowed to damage the resource, prejudice its future enjoyment or bring unacceptable impacts" (Harrison R. 1991:13).

In the same year, an international conference on the Heritage Landscape was held by the Council of Europe, and the National Trust designated 1992 as "Landscape Year". Then, the Museums Association chose "Museums in the Landscape" as the theme for the 1992 conference (Hewison R. 1992:30). It is now seen as a responsibility for museums to educate about the environment both looking at a changing landscape and a more scientific approach to pollution.
(B) SOME EXAMPLES

The museums which give the opportunities for studying environment are various. Within them, this author picks out environmental study centres which are a type of museum (see p62), open-air museums and ecomuseums which are arguably important for learners to experience the environment. Also, from different angles, environmental art will be introduced.

a) ENVIRONMENTAL STUDY CENTRES

There are over 4000 environmental study centres in the UK (see p62). Within them, the Field Centres of the Field Studies Council (FSC) are one of the most useful centres for the study of environments. The range of subjects studied includes natural history, ecology, geography, geology, environmental studies, conservation, land use and planning, meteorology, archaeology, local history, photography and art. These centres employ teaching staff who are fully qualified in a variety of field subjects. Facilities include residential accommodation, laboratories, equipment for work in the field, and libraries which are stocked with a wide range of books (Field Studies Council, 1989: cover page).

The FSC was established in 1943, and three years later the first field centre was opened. Today the FSC manages 11 centres throughout England and Wales. Thomas T, Director of the FSC, suggests that "First hand experience of the environment should be an essential part of the educational experience of all students. Fieldwork is the key to developing an awareness and appreciation of the environment. It offers opportunities for students to acquire knowledge and understanding of the environment through using a variety of skills" (Thomas T. 1993:2).
The FSC also cooperates with the NHM (National History Museum), London. Some FSC lecturers teach environmental issues in the NHM (FSC, 1992:18). In addition the FSC organises expeditions to some European, African, Asian countries and Australia (Field Studies Council, 1989:32).

b) OPEN-AIR MUSEUMS

Recently museums have become interested in conserving not only so-called artefacts but also total environments surrounding museums, including heritage houses, gardens, and also old-time workshops. Of many open-air museums, the Ironbridge Gorge Museum, UK, for example, seems to be one of the most educationally successful cases. The reason is that it is one of the first world heritage sites and it was the birthplace of the Industrial Revolution as well (The Ironbridge Gorge Museum, 1990:flyer). The main museum sites are: some museums and workshops surrounding hills and forests; the Iron Bridge built in 1779 and perhaps it is the best known symbol of the Industrial Revolution; Museum of the River - the River Severn was affected pollution and caused disease in the late eighteenth century (The Ironbridge Gorge Museum, ND:3).

Also, The Ironbridge Institute established in 1978 is a joint venture of the University of Birmingham and the Ironbridge Gorge Museum in which the two institutions cooperate in organising teaching programs and research including Diploma and Master courses in Industrial Archaeology and Heritage Management (The Ironbridge Institute, ND:cover page).

The idea of open-air museums are quite similar to ecomuseums in France.

c) ECOMUSEUM MOVEMENT

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"Ecomuseums" intend to give a visitor a comprehensive understanding of the culture, including environment of a particular area. "In an ecomuseum, every object, every building, every person within the museum's constituency including the museum profession, is on display" (Hudson K. 1992:27).

In the 1960s there were pioneer projects in remote country areas of France, which aimed to present the traditional culture within the natural environment (Ibid). "In the face of rural change and industrial decline, France introduced the concept of the ecomuseum" (Endacott A. 1992:32). The term "ecomusée" (ecomuseum) was devised by Hugues de Varine, the director of the ICOM, for use by Robert Poujade, the Pompidou government's radical environment minister, in addressing the 1971 ICOM general conference. He was defined an "ecomusée" as an interdisciplinary community-orientated museum of the ecology and environment, nature and human, of a defined territory (Boylan P. editor, 1992:29).

The French ecomuseum idea was adopted by other countries, particularly in Sweden, Mali, Portugal and Canada, and many have called their museums ecomuseums. However, Hudson suggested that strictly speaking, officially, there is no ecomuseum in Britain yet. Open-air museums in the UK are not ecomuseums since some buildings have been brought from elsewhere and reassembled on site (Hudson K. 1992:30,31), and also the concepts of ecomuseum is very strict (see above), therefore this idea has not accepted by British museums yet. However some museums call their own museums ecomuseums such as the Dartmoor Ecomuseum, Devon (Endacott A. 1992:33).

The concepts of open-air museum and ecomuseum however make people aware of the importance of the conservation of the total environment (both physical and built). It can be excellent environmental education through use of a visitor's leisure time.
d) ENVIRONMENTAL ART

Environmental problems can also be taught through environmental art in art galleries or museums. For example, a museum curator can select study areas for which "before" and "after" pictures are available in order to display and interpret such as: A former rural area, now covered with mammoth highway clover leaves; A former green area, now occupied by a large shopping centre or other major construction in which paving and rooftops have replaced earth (The Environmental Committee American Association of Museums, 1971: 78).

In the UK, for example, the environmental art organisation "Common Ground" runs travelling exhibitions, which explore the relationship between environment and culture through visual art, and have helped museums around the country to bring green issues to the general public (Reardon-Tagore K. 1991: 18). These ideas can also help develop cooperation between all kind of museums, in terms of environmental education.

(C) INTERNATIONAL AWARENESS OF ENVIRONMENTAL ISSUES THROUGH MUSEUMS

"The World Conservation Strategy (1980) and Our Common Future (World Commission on the Environment and Development 1987) both stress the importance of helping the public to understand why they should safeguard ecosystems and species" (Kelsey E. 1991: 551). In particular, zoos, aquaria and botanical gardens have a responsibility to educate the public about such matters.

In Canada, the Vancouver Aquarium, for example, is a unique facility, committed to the goals of education, conservation, entertainment and scientific research. The number of visitors per year is nearly one million and membership is 60,000. The aquarium is an important centre for science education as well as marine
environmental education using interpretive displays (Ibid).

In Sweden, Riksutställningar (Swedish travelling exhibitions) started in 1965, produced in cooperation with the Swedish Museum of Natural History, and pointed out the problem of pesticides and air and water pollution (Westerlund S. 1991: 35). For the European Nature Conservancy Year in 1970, it exhibited "Land to Live in". This dealt with man's transformation of nature and the history of the Swedish cultural landscape, stressing the importance of natural resources (Ibid). In 1987, the Swedish Museum of National Antiquities opened a large exhibition, entitled "Heritage in Danger". It took the visitor on a walk in a wasteland, through a polluted world. The exhibition has been shown in Finland, Norway, the Netherlands, and in 1990 at the Science Museum in London (Ibid).

In Asia, Hong Kong is one of the most polluted areas not least through acid rain. The economic boom in HK has attacked the environment since the 1970s. In 1992, to sustain public awareness of the threats to humanity, Hong Kong Urban Council and the WWF Hong Kong joined together to produce an environmental exhibition and published a book "Towards a Sustainable World" (Morton B. 1992:5). The exhibition and the book have given Hong Kong citizens the opportunity of learning about environmental protection.

(D) SOME EXAMPLES OF ENVIRONMENTAL EXHIBITIONS IN THE UK

a) MUSEUMS

The Science Museum, London, is keen to convey messages concerning the environmental crisis to the public although it does not have a permanent environmental exhibition yet. However some temporary (short term) environmental exhibitions do take place. For example, the Swedish exhibition "Heritage in
Danger" in 1990 considered waste disposal, air and water pollution (Insley J. 1991:16), (see p78). The Education Unit also published some useful environmental science leaflets for the public such as "Domestic Waste"; "Nuclear Waste"; "Pollution by Fertilizers"; "The Greenhouse Effect"; "Acid Rain"; "Energy from Water"; "Wind Power"; and "Geothermal Energy".

The Natural History Museum, London, especially has a responsibility to educate the public about environmental hazards through exhibitions or field workshops. The Ecology Exhibition, the biggest environmental exhibition in the UK, looks at "how living things interact with one another and with their environment to form thriving communities" (The Natural History Museum, 1992b:6). This exhibition will be researched by this author as his case study in terms of the exhibition's approach and visitor's behaviour.

Horniman Museum, London, which has been directly funded by the Department of National Heritage, achieves environmental education through cultural artefacts such as musical instruments, natural history objects and a garden (Boston D. 1992:30,31). It can make up for some lack of the NHM's exhibitions. For example, in particular, trails in the garden, which is not available in the NHM, can be effective environmental education.

The National Gallery, London, also considers environmental issues through its famous paintings. For example, using "Bathers at Asnières" by Seurat, in which some people are bathing in the river and near the river some factory chimneys are emitting smoke. The accompanying worksheet asks "Can you see anything causing pollution in the picture?" Also using "The Beach at Trouville" by Monet, in which a woman is putting up a parasol, the worksheet suggests the need for protection from harmful ultraviolet rays (The National Gallery, ND:1-3).
Oxford University Museum (OUM) exhibited in 1991 "Nature's Great Masterpieces: A Celebration of Elephants at the OUM". The museum ran a series of lectures on the exhibition such as the ivory trade. It aimed to provide information on the very real threats to the existence of elephants (Pickering J. 1991:37).

Centre for Alternative Technology (CAT) in Machynlleth, Powys, exhibits and demonstrates renewable energy technologies (solar, wind, water, energy conservation), and also the Armstrong Energy Centre (Northumberland), Bristol Energy Centre (Bristol) and Carmarthen Bay Wind Energy Demonstration Centre (Burry Port) each have exhibitions and demonstrations for school children and the general public (Renewable Energy Resource List, ND).

"Sutton Ecology Centre (Sutton) The purpose of the centre is to increase people's awareness of, and involvement with environmental concern. The centre acts as a focus for community environmental activities throughout the London Borough of Sutton. The centre has some various ecological sites and exhibitions for learning such as Butterfly garden; Bee hives; Recycling & Composing; Alternative Energy Display; Future Sensory Garden; Summer Meadow/Spring Meadow; Tree Nursery; Community Pots; and Exhibition of Urban & School Garden; (Sutton Ecology Centre, ND).

b) ANIMAL WELFARE

RSPCA (The Royal Society for the Prevention of Cruelty to Animals) is the oldest and one of the largest animal welfare societies in the world (RSPCA, 1990a). It has published some educational packs and organised, for example, an exhibition at the NHM, London, in 1990, describing the history of the society and current issues including "animal pits" and "intensive farming methods" such as battery egg production (RSPCA, 1990b:4).

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RSPB (The Royal Society for the Protection of Birds) has some bird watching sites with visitor centres. They are true natural zoos. The society educates and fosters a concern for wildlife, and cooperates with conservation organisations that are equally concerned about similar threatened birds. The society appeals to the public for the need for cooperation to conserve birds and wildlife pointing out that many thousands of estuary birds are threatened by industrial development and recreational pressure (RSPB, ND).

c) ZOOS AND AQUARIA

London Zoo is one of the oldest zoological gardens in the world. The zoo seeks to play its part in conservation and has a record in the breeding of endangered species. Some 85,000 pupils a year take part in its education program. This zoo is very popular amongst the public. For example, it created a true story "Winnie the Pooh" describing an American black bear's endearing behaviour, and the term "jumbo", which means "vast" comes from a big elephant name (London Zoo, 1991:2,44,46,48). However owing to the declining number of visitors, possibly because of the animal welfare movement, it intends to close, and will open with a more affective method of exhibition for the public in the future.

Safari and wildlife parks also educate about environmental issues. In 1988, the number of these kinds of parks in the UK was 24 (British Tourist Authority Central Information Services, 1988:1-5). West Midland Safari and Leisure Park, for example, is a joint safari and amusement park, and has an Education Centre. It has also some unique services to the visitors that is, they can borrow cameras from the park, and keep their dogs in the kennels provided by the park (West Midland Safari and Leisure Park, ND).

Butterfly Park (Long Sutton) has one of the largest tropical butterfly houses in
the UK. Visitors can see hundreds of the world’s colourful butterflies flying freely around them. The park includes Insectarium, Animal Centre, Nature Trail and Adventure Playground. An education pack and a nature trail flyer are available, both recommended by the National Curriculum Council (Butterfly Park, ND).

Aquaria also display marine environments to raise awareness of conservation needs. The Sea Life Centres (Hustanton and Great Yarmouth) are the biggest aquaria in the UK, which lead visitors under the water through a glass tunnel displaying hundreds of sea creatures including 6 species of shark which eventually grow up to 10 feet (5 metres) in length (The Sea Life Centres, ND).

d) BOTANICAL GARDENS

Royal Botanic Gardens Kew (London) is the biggest botanical garden in the UK, and the number of annual visitors is about one million. Its educational mission is "to increase public knowledge and understanding of the value and vital importance of plants, and to increase recognition of, and support for, the work of Kew". It also runs a schools outreach programme using an "education bus", and also is making close contact with the Museums Association and Senior Education staff in national museums (Royal Botanic Gardens, Kew, 1992:1,4,5,).

Royal Botanic Gardens Edinburgh is now researching seriously into the conservation of the natural world. Botanists from the Garden regularly visit areas such as Amazonia, Borneo, Himalayas, to produce a conservation strategy. One of the key objectives of its work is to use the considerable resources of the botanic garden for environmental education (Edwards I. 1991:37).

Ryton Gardens (Coventry) is the National Centre for Organic Gardening,
headquarter of The Henry Doubleday Research Association which is the largest organisation for organic gardens in the UK. It includes 30 variety gardens such as "Composting and Soil Fertility Display"; "Wildlife Garden"; "Weed Control Display"; "Pest and Disease Control Display"; and "Organic Lawn Management (Ryton Gardens, ND). All these displays are concerning with environmental education in terms of avoiding the use of fertilizer, herbicide and insecticide.

e) FARM PARKS AND HERITAGE SITES

Farm parks are also environmental education sites. These parks make visitors aware of the advantage of "old fashioned farming" in terms of the conservation of the natural world. Of these farm parks, Farm World (Leicester) is the biggest in the UK, including nature trails; craft workshops; ancient and modern machinery displays; an audio visual theatre; exhibitions displaying featuring the countryside at work (Farm World, ND).

Heritage sites are, needless to say, important areas for environmental education as well. Ironbridge Gorge Museum, for example (see p75), is a useful educational heritage site. Also old dock yards offer much to education about the environment. The Historic Dockyard (Chatham), for example, offers a cross-curricular context for work through museum displays such as the Ropery (still working using traditional methods and machinery), and education services which offer teachers and lectures, professional advice throughout the process of planning field work (The Historic Dockyard, ND).

This chapter, first of all identified some technical terms concerned with environmental education, and then looked into environmental education in general. In the final section, environmental education through museums was
examined from a variety of angles.

Recently, the relationship between museum work and environmental education has become more close. One of the themes of the 16th ICOM Conference in 1992, Canada, for instance, was "Museums and Environment". Consequently museums will have continuing and increasing responsibility as educators for the environment.

In the next chapter, visitor studies concerned with environmental exhibitions will be discussed.
CHAPTER 3

VISITOR STUDIES
FOR
MUSEUM EDUCATION

WHAT WILL VISITORS LEARN FROM THEIR VISITS?
IN FRONT OF THE NHM, LONDON, 1994
(PHOTOGRAPH: J. H. IGUCHI)
INTRODUCTION

Within museum education services, this author believes that exhibitions are vital. The main reason is that, as has already been discussed, the images of museums, according to some research, are derived from the impact of the exhibitions. This evidence (see pp.13,14) suggests that the majority of visitors have been educated by the exhibits themselves. Hence exhibitions must be designed with careful consideration given to visitors from both physical and psychological points of view in order to break conventional and rather negative views of museums. Especially, to convey the strong messages of environmental education to conserve the earth, the exhibitions must educate all visitors effectively.

Recently, environmental education has become prominent because of public awareness of environmental issues, and at the same time the design of educational exhibits has become a major priority within the museum world. As an example of this, Miles R.S. of the NHM (Natural History Museum), London, published (with other authors) a book in 1982 entitled "The Design of Educational Exhibits".

Needless to say, environmental education is quite different from subjects such as mathematics, literature and art, which can be generally achieved in schools, but environmental education cannot be taught fully in schools not least because it draws on more than one subject. Hence museums, zoos and field study centres, for example, have a heavily responsibility to educate all types of visitors. This is a major justification for this research work. Lucas A.M. suggests that modern museum techniques are placing increasing emphasis on structuring displays to facilitate learning and also zoos and gardens are attempting more overt teaching techniques, aimed at the casual visitor as well as at organised school
In order to create effective educational exhibits, first of all museums must know as much about their visitors as well as their particular subjects on display. Up to the present, a great number of museum exhibitions have been evaluated from visitors' points of view using a variety of scientific methods. One of the remarkable examples was that: in 1988, the Art Gallery of Ontario closed in order to create a new visitor-centred exhibition, and when it re-opened in 1989, the exhibit had been transformed in some very significant ways. This transformation was the result of collaboration between curators, educators, conservators and designers. The process has become known as "Gallery Enhancement" (Worts D. 1990:203).

This chapter will examine and discuss so-called "visitor studies" from a variety of angles to gain insights for this author's main case study.
VISITOR STUDIES IN GENERAL

(A) HISTORY OF VISITOR STUDIES

Many museum evaluation studies, often called audience research studies or visitor studies have been conducted in museums during the past 70 years. One of the best known pioneering pieces of research on visitor studies, focusing on visitors' fatigue during and after viewing the exhibit called "museum fatigue", was conducted by Robinson E.S., a psychologist, Yale University, USA in 1925, supported by the American Association of Museums and the Carnegie Corporation as a sponsor (Robinson 1930:9-11). As a part of this series, Bloomberg M. examined the differential effects on school children which were divided into 5 grades of intelligence levels. She concluded that the formation of questions by the children themselves was vital in terms of learning from the exhibition (American Association of Museums, 1984:65). However most visitor studies, research or evaluation had not been conducted until the 1960s.

In 1968, Shettel H. published his research on the criteria for judging the quality of museum science exhibitions (Shettel 1968:137-153). This is one of the first of the new studies of visitor behaviour (Patterson 1989:81). In 1973, one of the first experimental studies in museums was published by Screven, a psychologist, University of Wisconsin-Milwaukee, USA, who concentrated on instructional design and human motivation (Ibid & American Association of Museums:65). Also during the 70's, Roger Miles in the NHM (Natural History Museum), London, who is well-known as a pioneer of visitor studies in the UK, published his study of the exhibition of "Human Biology" at the NHM, London a new exhibition scheme (Miles & Tout, 1978:36-50). Butler asserts, about this exhibition, that "the gallery broke new ground for science exhibitions in the
UK, being concept-based rather than object-based. It has proved hugely successful in its provocative approach" (Butter S. 1992:91).

Recently academic bulletins of both the museum and education field show considerable amount of research papers on visitor studies. Examples of journals and bulletins include the bulletin of the "Centre for Social Design (Jacksonville, Alabama, USA); "Journal of Museum Education" (Museum Education Roundtable, Washington DC, USA); and "A Journal of Visitor Behavior" (The International Laboratory for Visitor Studies, Shorewood, Wisconsin, USA). However this area is new as a field of study and research. Hence museums are conducting this sort of research from a variety of angles in order to evaluate a range of research methodologies and collect a range of data before visitor studies can be established as a vital science for museums.

(B) CONTENTS OF VISITOR STUDIES

a) PHILOSOPHY AND MISSION OF VISITOR STUDIES

Of research centres for visitor studies, ILVS (The International Laboratory for Visitor Studies - Shorewood, Wisconsin, USA) is one of the most active laboratories.

The philosophy of this laboratory is that:

"The International Laboratory of Visitor Studies is an organization dedicated to improving the quality of visitor learning in public environments throughout the world. By inviting and sharing research from varied sources, cultures, and disciplines, ILVS believes that it can contribute to teaching/learning interactions which can have dynamic, long-lasting impact on public knowledge and attitudes...." (Exhibit Communications Research Inc. 1992:157)
Also the mission statement of this laboratory is:

1) to encourage and conduct research and
2) to disseminate this information to administrators, exhibit planners, designers, interpreters, and educators.

An expanded knowledge base will help maximize the educational impact of exhibits and programs for the self-directed learner. (Ibid)

Both statements emphasize planning and running educational exhibits for particularly the visitors without professional guides for their informal studies in maybe their leisure time.

b) DEFINITION OF VISITOR STUDIES

No official definition of visitor studies exists for museums and the field of psychology, since this field is still in its infancy. However, the "Statement of Goals" of the AAM (The American Association of Museums), (AAM Visitor Evaluation and Research Committee, 1988) is the nearest one can get. This statement implies four fundamental assumptions for visitor studies (Bitgood S. editor, 1989:10,11). That is:

1) Visitor advocacy: primary mission.
Visitors should play the major role in the design of both exhibitions and programmes. Traditionally, this has not been the case.

2) Multidisciplinary view: global approach.
The mix of viewpoints and expertise by specialists from for example exhibit design, education, visitor services, marketing, recreation and evaluation.

3) Formal evaluation: a technique for answering questions.
Evaluation involves the specification of criteria for judging the effectiveness of something.

4) Scientific: developing methods and theories.

The visitor studies approach uses a scientific model of collecting information about visitors, and a scientific model of theory building borrowing from psychology, sociology, education, and marketing to formulate empirically-based principles of visitor behaviour and informal learning.

In many academic fields, multidisciplinary research has been taking place since around the 60’s in areas such as electronics and mechanical engineering. Specialists research not only their specific area but also other studies related to their subjects to help develop theories. Visitor studies is a typical multidisciplinary area in which specialist from a variety of academic fields can contribute.

c) METHODOLOGY OF VISITOR STUDIES

Some papers describe the method of visitor studies and each description is quite similar to others. The following descriptions are summarized by this author using mainly the papers of Screven C.G (1990b:37-59), Bitgood (1988:5-7), (1989a:18,19) and the Centre for Social Design (1988:8,9).

The exhibition development in generally can be divided into four stages:

EXHIBITION DEVELOPMENT

1) Planning Stage:

Themes, audiences, objectives and messages are considered.

Front-End Evaluation (or Pre-Design Evaluation): Evaluation undertaken
before the project begins to help establish objectives and messages of the exhibition.

2) Design Stage:
Artefacts, layout, sequencing, lighting, signage, labels, panels and orientation are designed.
Formative Evaluation: to improve the functioning of the exhibit.

3) Construction and Installation Stage:
Developmental Evaluation: to rethink the design of the exhibit and also find some faults by architects or blue prints. This term is also used in design stage.

4) Occupancy Stage:
Traffic flow, visitor usage, attitudes, interests, learning, cost-effectiveness and also crowds, fatigue and noise are examined.
Summative Evaluation (or Post-Design Evaluation/Post-Occupancy Evaluation): Evaluation of the exhibit completed if the project is successful in terms of objectives.

Also, some papers describe "Post-Occupancy Stage". In this stage, adjustments may be made to the installed exhibition to correct some existing problems. This evaluation is called "Remedial Evaluation" which can correct post-occupancy problems. However, "Occupancy Stage" and "Post-Occupancy Stage" are often common in terms of the method of evaluation. And therefore the use of the term "remedial evaluation" is probably unhelpful and should be avoided since "summative" is in more common parlance (Miles R.S. 1993:26).

METHODS OF EVALUATION
Some methods of evaluation conform to the field of evaluation in education such as formative and summative evaluation which were originally defined by Scriven M. (1977:334-371).

1) FRONT-END EVALUATION
Whenever a museum is going to establish an exhibit with a specific theme, it must determine visitors' existing knowledge and preconceptions about the theme as well as their motivations for going to the museum and attitudes to the exhibit. Museums should look into the opinions of people who do not come to the museums by street interviews or mail surveys. Although people visit museums, most visitors have well established misconceptions or naive notions about the exhibit topic. Museums must correct their misconceptions and increase their knowledge in a satisfying manner and atmosphere.

Front-end Evaluation is conducted using some existing exhibits. The basic methods include interview (open-end, structured); focus group (from marketing research in which a small group of consumers is interviewed in-depth focusing on a particular topic or product); observation; and questionnaire.

2) FORMATIVE EVALUATION
In the design stage, using some information from visitors through Front-End Evaluation, a more realistic exhibition design is drawn. To achieve most effective evaluation, mock-up (or often called prototype) tests are run. A mock-up must be an inexpensive simulation of an exhibit or object in order to determine its most educationally effective design before a final exhibit is completed.

The methods of the testing are observation, interview and questionnaire. The testing of mock-ups can be divided into two, "Cued" and "Noncued". The former
is that visitors are told that they are being observed or will be questioned, and the latter is that visitors do not know they are being observed or going to be questioned. Cued testing is for knowing its teaching power (how it teaches the message to visitors effectively), and noncued testing is for knowing its holding power (a measure of time spent viewing an exhibit).

The main problem of these tests is that the effectiveness of isolated micro exhibits (parts of the whole exhibition - the macro exhibit) cannot be effectively evaluated prior to the occupancy stage because a mock-up exhibition environment is different from that of the whole exhibition completed. However exhibit planners need to make efforts to get as much useful information for a completed exhibition as they can in order to avoid modifications after opening to the public.

3) SUMMATIVE EVALUATION

After installation of the exhibit, summative evaluation is needed. The purpose is to examine if the exhibit does work effectively and reaches its objectives. At the same time, it gives insights for modifications or new exhibits in the future.

Summative evaluation covers a wide range of activities. First of all, before starting this evaluation, architectural and physical matters of the exhibit should be examined by experts. It ranges from architectural matters and the climate of the exhibit to the artefacts and labelling. After having done this job, formal summative evaluation can be started.

The method of this evaluation is similar to "formative evaluation" using the methods of observation, interview and questionnaire. Observation is often called "direct observation" compared to "self-reporting methods" (using
interview and questionnaire). This includes "Attracting Power" (the ability of the exhibition to attract visitors - usually measured as the percentage of the visitors who stop at an exhibit), "Holding Power" (see Formative Evaluation), "Viewing Time" (at a section and also in the whole exhibit), and general behaviour including "social interaction" between visitors. Observation can use both obtrusive and unobtrusive methods in which visitors do not know they are being observed. Usually it is best to use the method of data collection with the least intrusive methods whenever possible.

In this stage, a mock-up test can also be used if the museum regulations allow this. For instance, some museums do not allow setting up mock-up exhibitions, because they are incomplete and fail to offer a sense of beauty and thus may harm the overall image of the museum.

Furthermore, summative evaluation includes looking into long-term impact of a visit to the exhibition. One of these methods is follow-up investigations of visitors using mailed questionnaires asking how effective the exhibit was for them. Also at the same time, flyers, educational materials, the plan of educational activities, and outreach programmes, which all relate to the exhibition, should be evaluated.

RELIABILITY AND VALIDITY
It is vitally important to carry on the evaluation using most reliable and valid methods to get usable data. There are lots of arguments about these matters. However most papers describe the same idea (Bitgood S. 1988:4, 1989a:13-15); (Ellis J. & Koran J. 1991:72); (Centre for Social Design, 1988:8-9).

RELIABILITY
This is the degree of consistency or stability of behavioural measurements.
First of all, it is a basic point that the evaluation must be objective. This means that any personal feelings do not be allowed strictly to collect data and evaluate them. Observers must always follow the standardized procedure.

1. **Inter-observer Reliability**: if there is a gap between the results observed by plural observers.
   Before starting the observation, each independent observer must agree on the detailed method.

2. **Internal Consistency Reliability**: if there is a gap between the results when measurements take place at different places and times.
   All of the items on the test must be measured in the same way across times and places.

3. **Replication Reliability**: if there is a gap between the results of measuring the thing twice.
   The method of observation can be used repeatedly for the same thing or for the different things as well. This means that if measuring the thing twice, both results must be exactly the same. In order to enable the results to do so, the method must be described in enough detail.

**Validity**
This is the degree of the value of the results in terms of the method - the results might be different some what if the method is changed. The method must be elaborated by expert(s) so that the results are accurate and valuable. There are many aspects of validity. Some of them are selected and listed as follows.

1. **Construct Validity**:
   The degree to which the recorded data really measures what observers are
supposed to measure, especially through direct observation. For example, the viewing time recorded may include visitor's day dreaming time.

2. Recording Validity:
The degree to which the measurement system distorts the actual behaviour of visitors, especially in the Self-Reported Method such as interview and questionnaire. For example, the time spent in the exhibit which is reported by a visitor may be over estimated.

3. Content Validity:
The degree to which a sample of visitor's behaviour is representative of the behaviour which an observer wishes to test. For example, the viewing time recorded is influenced by various conditions such as crowded conditions and weather conditions when an exhibition is outside.

4. Predictive Validity:
The degree to which the results can be used to predict the visitor's reactions to other exhibits. If the method which was used for the evaluation did not take account of above mentioned validities that is construct validity; recording validity; and content validity, the results cannot be generalized to use for predicting the visitor's reactions to other exhibitions and for setting up other exhibitions.

These above mentioned descriptions of the contents of visitor studies are fundamental principles. In fact, these studies are more complicated in reality than in theory, since they cannot avoid considering other studies such as psychology and sociology. These matters will be discussed in the next section.
Visitor studies draw upon many subjects, since the nature of such studies are not simple. Strictly speaking, a museum evaluator should have the basic knowledge of visitor studies as well as museum studies, psychology, sociology and, if possible, the subject of the exhibition, because many reports of visitor studies use the perspectives of these subjects. Hence in this section, this author looks at psychological and sociological issues. In fact, many researchers in this field come from psychology, not the world of museums, because psychology especially environmental psychology and cognitive psychology are vitally important in creating educational exhibits as well as places of recreation. This section is a form of summary of existing papers in this field.

(A) ENVIRONMENTAL PSYCHOLOGY FOR DESIGNING EXHIBITS

a) DEFINITION OF ENVIRONMENTAL PSYCHOLOGY

A dictionary of psychology defines "environmental psychology" as:

"a true synthesis drawing from the data and theories developed in a variety of areas including social psychology; sociology; ethology (observation of the behaviour of animals in their natural environment); political science; architecture; and anthropology, and turning them upon issues involving the complex interactions between people and their environments"(Reber A. 1985: 243).

Also there are other definitions of this subject, for instance:
"This is the study of the interrelationship between behavior and the built and natural environment" (Fisher, Bell, & Baum 1984).

These definitions emphasize interaction between human behaviour and environment. In the museums and zoos, this subject includes architectural and exhibition influences on the sensory perceptions of visitors.

b) HISTORY OF ENVIRONMENTAL PSYCHOLOGY

Environmental psychology is a relatively new discipline within psychology (Reber A. 1985:243). In the 1940's, psychologists began to research the relationships between work environments and productivity using research from the fields of "human engineering and human factors" (Patterson D. 1989:80). In the 1950's, behavioural scientists and architects began to cooperate in designing buildings to offer the psychological needs to the users (Ibid). In the 1960's, Ittelson has first used the term, environmental psychology in his paper presented at the American Hospital Association Conference on Hospital Planning, N.Y. (Ittelson W. 1964). In the 1970's, some universities began to give the opportunity of studying environmental psychology (Patterson D. 1989:80).

From the 1980's to up to the present, environmental psychology has grown to maturity. "The Handbook of Environmental Psychology" (Stokols & Altman, 1987) included many applications in this field.

c) PHILOSOPHICAL SIMILARITIES BETWEEN ENVIRONMENTAL PSYCHOLOGY AND VISITOR STUDIES

Both fields have some philosophical similarities. Patterson suggests some similarities with "pragmatism"; "empiricism"; "methodological eclecticicism";
the "interactionist perspective"; and the "user perspective" (Patterson D. 1989: 82,83). This author reforms them and summarizes them into two approaches, "pragmatism" and "empiricism".

**Pragmatism**
Both subjects focus on field studies (inductive work) and less deductive theory because the most attractive building or exhibits may meet the user's needs. In general, architects are apt to judge buildings more for their aesthetic and engineering value than user's convenience to use it. Sommer emphasizes the role of environmental psychologist as an advocate for the users of a building (Sommer, 1983).

**Empiricism**
Pragmatism relates to empiricism since in order to collect information from the users, some empirical work in the field is indispensable. The empirical works are basically evaluations such as front-end evaluation, formative evaluation and summative evaluation using sometimes mock-up exhibitions, and using some methods such as direct observation and self-reported methods which are interviews and questionnaires (see also pp92-95).

d) **ARCHITECTURAL FACTORS**

"Architectural factors" and "exhibition factors" from the environmentally psychological point of view are usually a part of visitor studies. Both factors strongly related to each other and therefore the descriptions of these factors in the papers of visitor studies frequently overlapped. In this thesis, in order to avoid such confusion, this author defines "architectural factors" as; the factors of total environment in the exhibit which influence visitors' behaviour toward the exhibit including museum climate for visitors;
visibility; object satiation; and realism.

1. Museum Climate for Visitors

In museums, environmental control such as control of temperature, humidity and lighting is vital in order to conserve the artefacts. Also museums must consider offering visitors a comfortable museum climate over summer and winter, and crowded conditions when the temperature rises. However both purposes of climatic control for artefacts and visitors often conflict with each other.

In the outside setting, like zoos, botanical gardens and temporary exhibits, the exhibit planners must consider these factors. For instance, in order to avoid strong sunshine and rain, some shades are needed in front of exhibits such as animals. In addition, free resting places are needed for these purposes. Patterson and Bitgood reported that "visitors stayed longer at exhibits that were free of high and low temperatures, rain, wind and bad odours" (Patterson D. & Bitgood S. 1988:45).

2. Visibility

Exhibits need good visibility for the enjoyment and study by visitors. Visibility is reduced according to the level of LUX$^{(1)}$, glare from lighting, visual obstacles, barriers and distance from the artefacts or animals. Exhibits can be designed for visitors with lower eye level, such as for children and wheel chair users. Bitgood, Patterson and Benefield shows that visual barriers reduce viewing time and visitor satisfaction (with the exhibit), and also shows that the closer the animal is to the visitor, the longer the viewing time.

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(1) LUX: A unit of illuminance equal to the amount of light falling on a surface 1 metre from a source of 1 international candle or candela (Reber A.S. 1985 p410).
(Bitgood, Patterson & Benefield, 1986). In addition, Bitgood, Pierce, Nichols and Patterson have observed that increased lighting levels in a simulated cave exhibit increased viewing time as well as the satisfaction with the exhibit (Bitgood, Pierce, Nichols & Patterson, 1987:31-39).

However for the interest of environmental control for artefacts, the level of LUX often cannot meet visitors’ needs owing to the limitation of present technology for conservation of artefacts such as textiles, watercolours, manuscripts and many natural history exhibits which must be illuminated with low level of LUX (Witteborg, 1981:79).

3. Object Satiation
The exhibition with high density of objects through the gallery or a single section causes the problem of object satiation for visitors leading to fatigue, lack of interest and reduced viewing time. Also some visitors want to see as many objects as they can within a limited time, and then it causes the same effect on the visitor. Some researches on this effect have been documented. For example, after around 35 minutes in the gallery of the museum, visitors sharply reduced their attention to the exhibits (Falk, Koran, Dierking & Dreblow, 1985:249-257). Also, in art galleries with similar exhibits (paintings of a particular style), visitors spent decreasing amount of time in the gallery when they observed more paintings (Melton, 1935; 1972:393-403). In addition, Patterson and Bitgood suggested that the effectiveness of exhibits is decreased when zoos and museums show similar objects together (Patterson & Bitgood, 1988: 44). In order to overcome this problem, sometimes a variety of species can be shown together in a section.

4. Realism
Unlike conventional exhibitions which show only objects with labels, these days
sections using the methods of realistic exhibits are found in many museums and zoos. In museums, cultural artefacts are displayed in a reconstructed place such as a room of an old house or workshop, and sometimes with performances by craftsmen. Natural history objects are displayed in the dioramas which imitate a real African Savannah. In zoos, artificial landscapes are often used. Coe has suggested that naturalistic exhibits will hold the visitor's attention (Coe, 1985:197-208).

However realism is not always the best. Sometimes exhibit planners want to display same species together in a case such as small insects in order to make visitors easily compare their shapes, colours and patterns. In this case, video screens can help to show their habitats.

e) EXHIBITION FACTORS

Exhibition factors are defined by this author as:

- the factors of a specific nature of a single object which affect visitor's behaviour and/or attitude toward the object including "moving factors";
- "multi-sensory factors";
- "interactive factors";
- "aesthetic factors"; and
- "novel factors".

1. Moving Factors

Moving elements in an exhibit or active animals can increase visitor's viewing time in the exhibit (Patterson D. & Bitgood S. 1988:41). Some papers of this research show this evidence. For example, a machine working intermittently in a museum increased the number of visitors who wanted to see the exhibit (Melton, 1972:393-403), and a strong relationship between animal activity and viewing times was found across zoos in various parts of the USA by Bitgood & Benefield (1986). In addition video films in front of the exhibit can be used to show the
natural motion of animals such as crocodiles and koalas which tend to move slowly and infrequently.

2. The Multi-sensory Factors

Human senses of vision; hearing; smell; taste; and touch are fundamental to allowing the body to receive knowledge of things in the wider world. Visitors are ready to use these five senses to receive exhibit messages. If a visitor can use not only vision but also hearing, touch and if possible smell and taste together to receive the information, a visitor's length of stay in the exhibition increases. This factor is called a "multi-sensory factor" by this author. Several authors have found this evidence. For instance, exhibits which could be both seen and heard produced longer viewing times (Peart, 1984:220-237), and exhibits which could be both seen and touched could increase viewing time as well (Koran, Koran & Longino, 1986:227-244).

3. Interactive Factors

In conventional exhibits, the artefact is simply shown to the visitor with a label. An interactive exhibit means that some action by the visitor produces some reaction from the exhibit object (Patterson & Bitgood, 1988:42). Push-buttons and computers are often used in an interactive exhibit and also specialists answer visitors' questions. Some studies on these factors have been conducted. For instance, Melton reported that in the gallery exhibiting electrical devices, when an interactive element was presented, visitors' attention to the exhibit increased (Melton, 1972:393-403). Especially these kind of exhibits can be seen in science or natural history museums.

4. Aesthetic and Novel factors

People visiting museums sometimes want to encounter beautiful or novel objects. Consequently, often temporary exhibitions are set up to show these kinds of
objects. Exhibitions of Tutankhamen's mask or Venus de Milo are good examples.

Also museums can house special artefacts for permanent exhibition such as large jewels or Egyptian mummies. Several researchers have suggested that shape, colour and pattern of an artefact may determine the length of viewing time (Melton, 1972:393-403, Martin & O'Reilly, 1982:339-346), and visitors to the National Zoo, Washington, often make a queue to see the panda (Patterson & Bitgood, 1988:42), which is still an endangered species.

However exhibition planners must be careful to plan the installation of these kinds of objects such as beautiful and novel artefacts because if these artefacts are displayed close to less attractive artefacts, visitors often skipped the latter (Ibid).

(B) ROLE OF COGNITIVE PSYCHOLOGY IN DESIGNING EXHIBITS

Some definitions of cognitive psychology are follows:

"Cognitive Psychology is a general approach to psychology emphasizing the internal, mental processes. To the cognitive psychologist, behaviour is not specifiable simply in terms of its overt properties but requires explanations at the level of mental events, mental representations, beliefs and intentions" (Reber 1985:129).

Cognitive Psychology is, under the inferences from Gestalt Psychology, a series of studies which attaches much importance to the subjective side of behaviour as opposed to "behaviourism" which regards the objective side of behavior as important (Fujinaga, editor, 1981:660, translated from Japanese by this author).
These definitions suggest that cognitive psychology emphasizes the internal, mental processes underpinning the subjective side of behaviour. This means that cognitive psychology is more complex than behaviourism, because behaviourism essentially looks at the relationship between stimulus and response. However the nature of response caused by stimulus arises from a variety of factors such as intention, belief and culture.

Since the 1950’s, cognitive psychology has had an influence upon, both the field of social psychology and that of clinical psychology. Recently cognitive psychology has become an indispensable underpinning for information technology to enable it to create better artificial intelligence (Ibid).

Consequently visitor studies strongly relate to cognitive psychology in terms of relating an exhibit to the visitors. Although the purpose of visitor studies is not to research the field of cognitive psychology, in order to design effective educational exhibits, such studies can contribute to the development of cognitive psychology.

In this section, some vital themes are discussed. These include orientation; labelling; the use of computers; factors influencing viewing time; and recollection.

a) ORIENTATION

"Orientation" is vitally important for people who wish to start any work (e.g. joining a university course or viewing an exhibition) planned and organised by others. In museums, in order to give visitors effective education through exhibits, in the first place, clear orientation of the exhibit must be given to enable visitors to grasp the overall plan and conception of the exhibit. Orientation can be divided into "topographical orientation" which refers to
physical layout and "conceptual orientation" which refers to subject matters. Needless to say, all devices used for both types of orientations must be defined by the visitor (Griggs, 1983:130).

**Topographical Orientation**

Some better exhibitions have been constructed with a carefully considered route and sequence through the gallery so that visitors can walk easily through from the entrance to the exit. Therefore, if topographical orientation shows the visitors this sequence effectively, problems caused by carelessly considered ground-plans will be reduced.

Topographical orientation includes the overall flow of the route and physical layout of the display. In each section of the exhibition, if the numbers are to be used to show the sequence in any cases, they must be clear and organized in a sensible fashion (Ibid).

In addition, a visitor's cognitive map is often used in researches into museum studies. The term "cognitive map" has been coined by Tolman (1948:189-208) as "to describe the internal representation that people construct of their external environment and which they use to find their way around". Griggs suggests that "during the course of visiting a display, visitors will construct cognitive maps irrespective of any attempts to provide or improve orientation. However, our assumption is that the quality of these representations can be greatly enhanced by effective orientation" (Ibid:121).

**Conceptual Orientation**

Conceptual orientation is to give visitors the appropriate expectations before they encounter a display using in most cases, panels (general labels - see next section). It enables visitors to grasp the broad outline and aims of the
exhibition and gives them enough information on how it is organised conceptually so that they can study the exhibit rationally and effectively. Conceptual orientation needs to be provided throughout an exhibition, for instance overall orientation in the entrance, each section's orientation and orientation for a small sub-section. Lakota suggests that conceptual orientation can provide explicit statements of what an exhibition is designed to convey, and provide introductory questions to guide visitors' thoughts in the appropriate direction, in order to ensure that the organisational structure throughout an exhibition as well as in a section is made clear (Lakota, 1976).

To create effective conceptual orientation there are two main questions raised by Griggs (1983:131):
1. How to attract and hold visitors' attention to that necessary information.
2. How to communicate that information to them.

In order to achieve the aim of effective orientation both topographical and conceptual, some evaluation studies are probably needed, such as formative evaluation with mock-up exhibits and summative evaluation as well (see pp82-85).

b) LABELS

Having researched some writers (Brucaw G. 1990:6; Hornby A. 1990:695; Witteborg L. 1981), this author defines "a label in exhibits" as:

a writing material beside on or near museum object(s) to identify its or their name(s) and nature. "Label" can be divided into "general label" and "secondary label". The former is for a group of objects or for area, which includes the texts of topographical and conceptual orientation, and sometimes called "panel" or "information board". The latter is for a single object
called "object label".

In order to provide information on the various objects to visitors, labels are very often used. Some exhibits do not have labels so that visitors just visually experience objects, and give them scope for use of their imagination without any overt educational messages. However in particular, in science or natural history exhibits, education is emphasized to achieve the objectives of museum education as well as visitors' demanding that. Hence information on the labels are an essential form of education.

To begin with, Label designers must be aware of the psychological and physiological mechanism that influence people's reaction to exhibitions. Secondly, designers must bear in mind the reasons why people visit museums. These include relaxing, socializing with friends or family and studying. Then thirdly label design must focus not only on cognitive outcomes but also on affective outcomes which meet the needs of a wider range of reasons why people visit museums.

Various studies on labelling have been conducted by researchers. This author summarizes their papers and groups them into these categories: "Content"; "Organisation"; and "Placement".

CONTENT

Philosophy of Content:

Basically, information described on the label must be technically correct and be closely related to the object(s). Sometimes label content can include questions and comparison so that a visitor's attention to the label increases. In addition, passive sentences should be avoided wherever possible (Witteborg, 1981:85). Also labels must be designed, in terms of content, in order to clear up
visitors' misconceptions. To identify such misconceptions, some evaluation studies are needed, such as front-end evaluation which enable to find visitors' misconceptions of the subject matter on display using interviews.

**Comprehension Level:**
The comprehension level of visitors in terms of label content is very wide and ranges from young children to specialists. However, generally speaking, information on the label must be comprehended by the general public. Serrell suggests that there are some conceptual and vocabulary barriers in label design (Serrell, 1988:577-585). The problems which frequently arise are through the use of technical terms and jargon. In addition, the text must be grammatically correct and employ an improved writing style (Bitgood, 1986:2).

**Length of Information:**
Some reports of results of this investigation are available. These can be divided into four such as:

1. The number of syllables per 100 words:
   130 to 150 syllables per 100 words is optimal (Serrell, 1983).

2. The number of words per sentence:
   10-20 words per sentence is the maximum (Ibid).
   10-15 words per sentence, never more than 22 is the best (Witteborg, 1981:84)

3. The number of words per label:
   Less than 75 words appear to have the greatest chance of being read (Bitgood S. 1990:121).

4. Information Overload:
   There should be no more than 5 to 7 items of information per label (Witteborg, 1981:84). Information overload as well as increasing the number of labels linked to an object causes problems of satiation which
influence a visitor's attention to the label.

**ORGANISATION**

**Legibility**

Legibility in terms of designing labels relates to the contrast between text and background; letter size; and eyesight.

1. **Contrast:**

Smith and Wolf found that the contrast between text and background has a significant effect on legibility (Smith & Wolf, 1991:48-52), and also Witteborg suggests that the contrast between the letters and the background should be as strong as possible, hence black letters on a white background are recommended (Witteborg, 1981:85).

2. **Letter Size:**

Bitgood et al. reports that increasing font size from 18 to 36 increased the number of readers by about 15 % (Bitgood, Nichols, Pierce, Conroy & Patterson, 1986). Also Witteborg suggests that the size of the typeface for general labels should be bigger than 72 point (about 15mm in height) and the minimum size for objects labels should be 24 point (about 6mm in height), (Witteborg, 1981:85).

3. **Eyesight:**

The most common eyesight problems are experienced by elderly and colour blind visitors. Many elderly people need reading glasses in their everyday life, hence font size must be as large as possible. In addition, colour blindness, especially red-green, is another visual limitation. This problem is mainly experienced by males owing to a *sex-linked genetic trait* (2) (Approximately 1 in 15 men showing some defects but only about 1

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in 100 women), (Reber, 1985:132). Consequently red letters cannot be used on a green background.

Layout:
The final step in organising labels is the layout of information on the label. The method of layout includes: information mapping; layering information; and bulleting the major points (Bitgood S. 1990:125).

1. Information Mapping:
Screven suggests that information mapping is a way to help visitors appreciate the information more easily (Screven, 1986:109-137). This method includes indentations, boxed enclosures, flow diagrams, type styles, and colour.

2. Layering information:
This is also suggested by Screven (Ibid) that information needs to be divided into small sub-sections and "layers" expressing the main ideas in larger or bold letters and the details in smaller letters. This makes it easier for visitors to identify or select the information which they prefer to study.

3. Bulleting:
"Bulleting the main points is yet another way of making it easy for visitors to find information" (Bitgood S. 1990:125).

Placement
Although a label has been elaborately produced in terms of its content and organisation, inappropriate placement of it in the exhibition area spoils previous efforts to design the label effectively. Exhibition designers must bear in mind the placement in terms of eye level, distance from the object, lighting and density of labels.
Eye level:
Visitors often just scan a label without changing their position, in other words, standing on tiptoe or stooping. That is why the placement at eye level is strongly recommended. Especially in case of position on a vertical wall, it must bear in mind to place the label for various eye levels - for instance, those of children. Also the field of vision by humans occupies a cone roughly defined by an angle of 40° (Witteborg, 1981:13). Hence labels must be placed within this angle.

Distance:
Distance from a label to the object must be considered because if the labels are placed far from the object or too close to other labels or objects, visitors may not want to read it or confuse one with other. Bitgood et al., discovered that moving labels closer to the objects made more people read the labels (Bitgood, Finlay & Korn, 1986:6-7).

Lighting:
Lighting influences readability. In particular, poor lighting levels makes visitors with low eyesight strain to see it. Smith and Wolf reported that low levels of light as well as glare, and shadows of light interact with contrast between letters and background (Smith & Wolf, 1991:48-52). In addition in order to illuminate the label, an absolute minimum of 5 foot-candles (3) should be used (Witteborg, 1981:85).

Density:
Label density is another problem of placement. High visual density causes

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(3) Foot-candle: the intensity of one candle at one foot distance (Reber A. S. 1985, p106)
confusion as well as fatigue. Bitgood also suggests that too many labels on the wall means that they compete with one another for a visitor's attention (Bitgood, 1990:122). This means that visitors cannot concentrate on reading the labels.

All in all, label designers must consider these factors using existing knowledge through researches as well as using the results of their own evaluations such as front-end, formative and summative evaluation.

c) COMPUTER DEBATE

In many museums, computers are widely used for education services in galleries, or for other educational purposes. However, computers are not always better than other conventional educational devices such as labels and graphics. Some arguments about these matters follow.

Many researchers criticize the use of computers for educational purposes in museums. Screven suggests that computers are not the only way to educate in museums. He argues that "Low-tech" interpretative media like labels or a discovery room for example can achieve the same purpose at less cost (Screven, 1986:109-137). Also McManus suggests that "Low-tech" approaches can be more effective than computers (McManus, 1990:125-127). One of the reasons why computers often generate considerable holding power is that they offer the fun of manipulation rather than their teaching power (Screven, 1990a:131). Moreover, in crowded conditions in a gallery, it is very difficult to serve the computers for all who wish to use them because they are still costly to purchase (Ibid:136). These arguments are essential at the planning stage of installation.
On the other hand, generally speaking, many advantages of using computers or video desks have been reported because of their large variety of special qualities such as large storage and multimedia capabilities. Screven suggests that "simulation can place visitors in real-world condition such as a rainforest and a planetary system for example. Animation can also make it easier to illustrate how blood vessels work for instance" (Ibid:135). In addition, visitors not only receive simply information from computers but also can control windows with various ways to suit their interests. This feature of computers is called "hypermedia environment" (Whitney, 1990:91-108). In fact, recently, there has been progress in using computers in museums to directly link visitors with relevant exhibit information (Screven, 1990a:133).

All in all, whenever museums want to install computers, they must consider cost-effectiveness as well as the effective delivery of information.

d) VISITOR'S LENGTH OF STAY

The visitor's length of stay including viewing time naturally can influence people's recollection in terms of exhibitions. The factors affecting this matter are many, and the methods of investigating this subject are various too. Some discussion now follows.

FACTORS OF LENGTH OF STAY

Haeseler suggests that cultural and commercial attractions affect visitor's length of stay (Haeseler, 1989:255,256). A summary of this argument follows.

Internal Factors:
The factors of the design of an attraction which influence the visitor length of stay.
1. Setting: inside or outside.
   Outdoor attractions typically have longer lengths of stay than in the case for indoor attractions. This evidence comes from the results titled "Average Visitors’ Length of Stay and Various Facility Characteristics at Illustrative Types of Cultural and Commercial Attractions" quoted by Haeseler (Ibid).

2. Attraction Content: size and intensity of the attraction content.
   The size of the attraction often influences visitor length of stay and the intensity of the attraction content also exerts an influence, e.g. dynamic versus static; live versus inanimate; interactive versus passive; and also a physical experience versus sedentary experience.

3. Visitor Services: e.g. cafeteria, restaurants and shops.

4. Visitor Fatigue:
   The issues of visitor fatigue arises particularly from indoor settings. Haeseler suggests that “visitors exposure to exhibitions, particularly in indoor settings such as museums may have a tolerance limit” (Ibid).

External Factors:
The factors beyond the design of an attraction which influence the length of stay.

1. Seasonality: seasonal factors such as changes in temperature affects visitors’ length of stay.
2. Crowding: crowded conditions typically on summer weekends appear to cause visitors to shorten their stay.
3. Time budgets:
   The more a visitor wants to view different settings in a limited time, the shorter his/her stay at each setting.
4. Demographics: individuals; families; and friends; or general people; and specialists. For instance, families with children tend to stay longer
than adult groups (Ibid), and also specialists and students stay longer when they are researching the subject matter. These factors relate to sociological points of view.

In addition, Beer suggests the goals of museum visitors which can be divided into four types:

"1. Factual knowledge for self;
2. Factual knowledge for child or guest;
3. Extra time on the way to another destination;
4. Relief from boredom or the weather."  (Beer, 1987:211)

Furthermore Serrell and Becker suggest three types of visitors in terms of behaviour and motivation. These are as follows.

1. People who spend a long time and study everything.
2. People who browse through, spending less time and looking at less.
3. People who rush through, uninterested, and hardly looking at or reading anything. (Serrell & Becker, 1990:263)

Thus, without knowledge of these factors, the visitors' length of stay cannot be discussed at depth. In addition to this, exhibition evaluators must use this knowledge whenever they evaluate a exhibition in terms of visitors' length of stay.

METHODS OF MEASURING LENGTH OF STAY

The choice of the method of this measurement depends particularly upon the museum budgets, since these methods vary from relatively low cost to high cost (such as tracking by staff). Haeseler suggests various ways of measuring (Haeseler, 1989:252,253). A summary is as follows.
Estimate by Management: A management estimate based on judgment developed in day-to-day operation of the exhibit.

This data is not dependable but can often be relatively accurate.

Recording Entrance and Exit Volumes: Comparing the number of visitors entered an exhibition with the number of visitors exiting the exhibition at fixed intervals, for example every 15 minutes.

This data is more accurate than the former method. It is used in situations where an intrusive method is not appropriate.

Recording Entrance and Exit Times: A visitor's sticker issued at the entrance noting the time of entering is collected at the exit to measure the visitor length of stay.

This data gives an exact length of stay, and also this method is one of the least costly. However this is a rather intrusive method.

Estimates by Visitors: Asking directly a visitor his/her length of stay using the method of interview or questionnaire.

This data might be distorted (Bitgood & Richardson, 1986) or overestimated by a visitor. However the data may still be generally useful.

Visitor Tracking: Tracking covertly a visitor throughout the course of their visit from entrance to exit.

This data gives an exact length of stay. Simultaneously this method obtains other data in concerning visitors' behaviour and attitudes. However, this is the most labour intensive and sometimes the data is not valuable if the visitor is aware of being tracked.

The above discussion of the visitors' length of stay can be useful in a variety
of circumstances such as for a whole museum or one specific exhibition. Under most circumstances, less intrusive methods are the best way to obtain dependable data, because if a visitor is aware of being observed, the visitor might change his/her length of stay.

e) RECOLLECTION

Recollection which is a general term for remembrance of things past (Reber, 1985:621) relates to cognitive psychology. Museums are places where people can learn some information through the exhibits and/or just enjoy looking around the exhibits as a form of recreation. However after a museum visit, whether they wish or not, people's new knowledge which they have obtained from the exhibition naturally affects their lives. Consequently, if a museum wants to give a specific message to visitors through the exhibit (such as environmental education), the exhibition should be memorable in order to help visitors recollect such information easily after their visits.

The factors of recollection depend upon the design of the exhibit as well as a visitor's attitude during the visit. Falk (1988:65) suggests some factors in terms of a visitor's attitude which is summarized by this author in this way:

1. What aspects of the experience, such as learning the subject matter or having refreshment, were considered important at the time.
2. What specific parts of the exhibit were actually perceived.
3. What sort of prior experience the person had, for instance, having visited similar exhibit(s), or studied the particular subject of the exhibit.
4. What sort of cues, such as prompts, were used to elicit the recollections.

One of the case studies on the recollection by Falk (Ibid:61-63) is introduced as follows:
The samples used in this study were not systematically derived. He talked to friends, relatives, people sitting next to him by chance about their museum experiences using very simple questions. Some remarkable results were obtained. Firstly, some visitors could remember quite clearly the visit a long time ago – e.g., the 54-year-old man visited the Smithsonian when he was 9. Secondly, all individuals remembered the museum's architecture or feeling of boredom caused by less attractive exhibits or museum fatigue. Thirdly, most respondents, children to adults, could recall at least a few exhibits in a museum and some details about them.

However to collect data on museum recollection is one of the most difficult tasks within visitor studies in terms of its reliability and validity. If the researcher collects the data about some particular exhibits of which he/she has a thorough knowledge, the data obtained will be analyzed relatively easily. On the other hand, such analysis is made more difficult when the researcher does not know the exhibit intimately.

(C) DESIGNING EXHIBITS FROM A SOCIOLOGICAL POINT OF VIEW

For designing exhibitions, in general, environmental psychology and cognitive psychology provide vital insights for considering the needs of individual visitors. In addition, however, a knowledge of sociology can help in designing exhibitions, reinforcing the contributions of both area of environmental psychology and cognitive psychology, since some of the factors which influence the viewing time are age, gender, socioeconomic/ethnic factors and educational backgrounds. In addition to this, most zoo and museum visitors are family groups (Patterson & Bitgood, 1988:44-45).

a) DEFINITIONS OF SOCIOLOGY
"The science which studies the development and principles of social organisation, and generally group behaviour as distinct from the behaviour of individuals in the group" (Drever, 1971:274).

"The discipline that focuses on the study of human behavior from the perspective of the social dimension. Sociology concentrates relatively less upon the individual as a separate entity than does social psychology, tending to view behaviour as it occurs in social interactions, in groups, for example" (Reber, 1985:711).

Both definitions emphasise that sociology focuses on group behaviour. It also often overlaps with social psychology and anthropology.

b) PROCESS OF THE FORMATION OF GROUP BEHAVIOUR

An understanding of the process of the formation of group behaviour is indispensable to the design of exhibitions from the sociological point of view. Aveni's paper (Aveni, 1990:48-54) describes this matter.

He argues first of all that when a person is born, he/she belongs to his/her own family called a family of orientation. The parent(s) teach(es) a child how to interact with others and this is called socialization. This involves his/her culture including his/her values, beliefs and rules for behaviour. When becoming an adult him/herself, the person may marry and have (a) child(ren) and thus creates a second family known as a family of procreation. These parents socialize the child(ren) with the same way as before.

When children become older they look toward their friends, and thus the children are influenced by the friends as well as their parents, and become members of small groups in which they feel very close or intimate with other members.
These are known as primary groups and include the family, play groups, school groups, for example. The primary groups have their own group norms and if a member is against these norms, some punishment is meted out.

Afterwards, people's memberships of groups continue to extend far beyond those in the original intimate groups and they also belong to many groups. Their relationships in these are less personal and more superficial but such memberships are very important to them. Such secondary groups include school groups, work groups, and also professional, political, religious and recreational organisations. Consequently, people belong to many groups and each individual has multiple group memberships and the web of these memberships are sometimes referred to as friendship networks.

In addition to primary and secondary groups, there is another way to categorize the term "group". These are known as societal categories and life experiences. Examples of the former include age, gender, nation, profession and university, and the latter includes the Depression; World War 2; the Vietnam War; widespread use of computers.

In conclusion, each individual belongs to some specific groups each having specific norms. People also exchange information using symbols (i.e. words) that is symbolic interactionism - coined by Blumer in 1969 (Sotobayashi, Tsuji, Shimazu, Nohmi 1981:223). This means that conversations between different groups can be sometimes difficult since meanings are not understood. Aveni suggests that "people often think or assume that they are sharing the same experience in the same way, but in fact they may not" (Aveni, 1990:51). Consequently, exhibition designers must create exhibitions for both individual visitors in their specific groups and group visitors, taking account of age, socio-economic standing for example. These priorities are not easy to achieve.
because of various demands by visitors in an exhibition. However some specific exhibitions for particular groups can be relatively easily designed and these kinds of exhibitions may be able to greatly influence such groups in terms of acquisition of new knowledge.

c) FAMILY BEHAVIOUR IN EXHIBITIONS

The numbers of family visitors are usually biggest in general exhibitions. So the study of the behaviour of family visitors is significant in terms of designing exhibitions. Kropf’s paper (Kropf, 1989:5-8) discusses this matter using papers, from Benton (1979), Wolf and Tymitz (1979), Rosenfeld (1980), Diamond (1981), Hilk and Balling (1985) and Taylor(1986).

First of all, in general, families come to exhibitions with a range of social agendas. Families viewing the exhibition may consider the acquisition of new knowledge as less important (Rosenfeld, 1980 quoted by Kropf, 1989:7, & Spires, 1980:13). In addition to this, families often discuss exhibits in terms of their previous experiences and therefore the acquisition of new knowledge may be not so important for them (Taylor, 1986 quoted by Kropf, 1989:7, & Spires, 1980:13). The families may simply see visiting the exhibition as a leisure activity.

LENGTH OF STAY OF FAMILY VISITORS

Typically, family visitors tend to walk through an exhibition without long stops to view particular sections. However if they can interact with exhibits or museum guides, the length of stay tends to be longer. In addition, novel or unusual content attracts them for longer periods. One of the reasons for the short length of stay depends on children’s behaviour. For instance, young boys often investigate their favourite exhibit ahead of the family group, and this encourages the family groups to move on quickly. Benton (1979 quoted by Kropt,
1989:6) found that in zoos, the length of watching exhibits such as animals by family visitors was only one third of their total spent time in the zoo. The rest of the time was used for just walking, using the playground, and especially eating since most families spent more time at the food concessions than viewing the exhibits probably because of children’s demands.

LABELS AND LEARNING

Reading labels and panels is not popular amongst family visitors. Especially "children are much less likely to read labels and are more affected by motion" (Bitgood, Nichols, Pierce & Patterson, 1986; Koran, Koran and Longino, 1986:227-244). Family visitors tend to be more interested in viewing displays which immediately catch their attention than labels which do not attract them in the first place.

However, in zoos, children ask most questions such as the animal’s name and have personal interactions with animals. Adults tend to interact more frequently with children than other adults, and children are more apt to converse with adults than other children, that is, exchange of information between family members tends to be mostly between adults and children. Consequently adults sometimes read labels in order to answer children’s questions.

AUDIO TOUR AND MUSEUM GUIDES (DOCENTS)

People visiting museums with family or friends wish to engage in social interaction. In this case, "the use of an audio tape tour with a portable tape recorder discourages their social interaction"(Bitgood, 1989b:3). However according to Spires’s paper, audio tours do not disturb a family’s interactions, and rather encourages their conversations. Since, in her case study, "family members were asked to turn off the tape frequently for discussions at their own pace and to view other works of art not highlighted by the audio tour" (Spires,
1989:13). She quotes from some visitors: "Very fine, stimulated communication in a family on the rocks at this time." "My daughter and I have not talked for weeks until today, thanks." These comments are not representative of all family visitors, but an audio tour can work in terms of education for the family as well as their interaction if designed deliberately as explained above.

However some guided tours by docents (museum guides) seem to be problematic. One of the problems is that families do not listen to the commentary by the trained guides, nor do they ask questions (Rosenfeld, 1980, quoted by Keropf, 1989:8). Another problem is that volunteer interpreters often do not have enough training or knowledge to answer visitors' questions (Taylor, 1986, quoted by Kropf 1989:8). Consequently well-trained docents who correct visitor's misconceptions as well as attract them are needed.

d) GENDER DIFFERENCES IN VISITORS' BEHAVIOUR

Differences between male and female in terms of their preference for museum objects have been investigated by some researchers. Patterson and Bitgood suggest that females are less likely to prefer snakes and insects than are males (Patterson and Bitgood, 1985).

Korn R. (1990:256-262) also found distinctions between both genders. In a case study (on the National Museum of American History, the USA, 1989), first of all, the observations indicated that more men (76%) approached weapons than women (24%). Secondly in the pots exhibition, only 11% of males were interested in pots, although 36% of females were attracted by them, according to interview responses. However, when asked the theme of the pots exhibition, only 10% of females were able to correctly identify this whereas 60% of males answered correctly.
This research suggests that people come to exhibitions in order to view museum objects, not necessarily to see conceptual themes and stories, and this may be particularly true for females. Consequently, the power of the object is significant.
In the former sections, the fundamental principal and the basic terminology of visitor studies have been discussed. Based on this knowledge, in this section, practical issues of visitor studies will be examined. The resources used for these arguments come mainly from Miles' unpublished paper "Coming to Terms with Museum Visitors" (Miles R.S.1995).

(A) INTRODUCTION

Firstly, visitor studies should be examined in relation to general visitors. The term "average visitors" which is frequently used in these studies should not include specialists, like ecologists in ecology exhibitions. Also, organised parties of students and guided tours are not relevant in studies of average visitor behaviour. Secondly, visitor studies should be empirical and should not be theoretical, that is the main task of the studies is to record what goes on in exhibition areas as well as non-exhibition areas in terms of visitors behaviour "rather than state what should be happening on the basis of some ungrounded theory" (Miles R.S.1995). Using some relevant literature of visitor studies, which include variable results, the following fundamental and vital questions will be examined:

1. When and why do the general public go to museums?
2. What do visitors do in museums?
3. What do visitors learn in museums?
4. What sorts of memories do they recall?

Question 1 relates to motivation; "2" relates to visitor behaviour in the whole
"3" relates to cognitive learning as well as affective learning; and "4" relates to episodic and semantic memory (see p133). These questions might be indispensable in improving museums which are open to the general public.

(B) WHEN AND WHY DO THE GENERAL PUBLIC GO TO MUSEUMS?

Investigations of the frequency of and motives of visiting are fundamentally practical tasks in visitor studies. According to Davies's estimation (1994), 20% of UK adults rarely go to museums, 40% are regular visitors (at least once a year) and the other 40% are occasional visitors. Also there have been several investigations into non-visitors (e.g. Hood 1983, Prince 1990, Merriman 1991 quoted by Miles R.S 1995). In relation to studies concerning the motivation for museum visits, there have been many surveys but few clear answers. However, through these existing surveys, it might be said that most visitors do not want to study the subject matter seriously. Alt suggested (1980) that the most common reason for visiting was "general interest and curiosity" as far as the investigation into the Natural History Museum (London) is concerned. Similarly Davies (1994) reported this matter through his wider review of UK museums that education was not a main reason for visiting. Furthermore, Riew (1988:128) found that only 23% of visitors came to museums for study, and he confirmed the result through wider investigations in the UK, Germany, USA and Canada.

According to existing results, the most common reasons for visiting can be summarised that people go to museums in their leisure time for:

- relaxing,
- general interest,
- seeing novel objects,
- family interaction or
- social activity.

"Relaxing" includes "time filling" even escape from bad weather. In addition to
these, Davies (1994) concluded that as far as UK museum visitors as a whole are concerned, they want a day out for an enjoyable experience rather than for an opportunity to educate themselves, irrespective of whether they are first-time visitors or frequent visitors. However the purpose of some visitors as well as school groups is actually to study the subject matter exhibited. And therefore museums must plan and set up exhibits as well as other facilities for meeting these various reasons for visiting. And museums must bear in mind that they are educational institutions for the general public and are not amusement parks for people's relaxation.

(C) WHAT DO VISITORS DO IN MUSEUMS?

Once people have become "visitors", what do they do in museums? This question is the main focus of many visitor studies and a great deal of investigations has been conducted by museum workers as well as specialists outside museums. Main items of these investigations are "length of stay" (see pp115-119); "viewing time"; "museum fatigue" and "group behaviour".

Firstly, strictly speaking, most results of length of stay are useless for improving museums, because they did not show how much time was spent viewing exhibitions compared to the time spent in other parts of museums such as lobbies, restaurants, shops and toilets. Even when time spent in each part of the museum is measured, the results are unlikely to be useful generalisations, because the results are influenced by many factors such as the size of the museum and exhibition areas; number of exhibitions; and other facilities available. Falk & Dierking (1992) suggested that 25% of length of stay was used for the social context of the visit like family interactions, and similarly Diamond (1986) reported that about 20% of total visitor's length of stay was used in non-exhibit areas. Using existing studies, Miles (1995) estimates that the average visit lasts between two and two-and-a-half hours in large science
museums (about over 10,000m² of exhibition space), and about 50% of this time is spent in exhibit areas. The other 50% is spent in other facilities "as well as gossiping, managing children and watching other visitors" (Ibid).

Secondly, "viewing time" which is how long a visitor spent in the exhibition area, has been measured and discussed by many evaluators. Through existing results, it can be said that the majority of visitors do not stop long in one place so as to save energy for viewing the objects which interest them which might be encountered later (Robinson 1928, Melton 1936, Porter 1938, Cone & Kendall 1978, Beer 1987). Beer (Ibid) reported that many exhibits were ignored that is there was a high "skip rate". Weiss and Boutourline (1963 quoted by Miles 1995) also reported the results of their study in a science and technology exhibit at Boston Museum of Fine Arts that:

"visitors seem to want to develop a sense of the hall as a whole, rather than a sense of each individual exhibit. If there should be something particularly attractive or particularly prominent in the hall, visitors seem to want to examine this. On the other hand, when exhibits present material similar to material already looked at, visitor tend to skip along."

Concerning exact viewing time, Falk et al. (1985) observed visitors to the Florida State Museum of Natural History and reported that the average visit started with a few minutes' warm-up period, then spent about half an hour for viewing the exhibits, then wandered through the remaining exhibits. About Holding Power (HP - how long visitors stop to view an exhibit), Beer (1987) gathered averages from a number of sources and reported that they were from 10 to 40 seconds, and "museum workers commonly use 30 seconds as a first approximation" (Miles 1995). Similarly Diamond (1986) found in the Exploratorium (9,700 m² of exhibition space) and Lawrence Hall of Science (4,300 m²) that visitors stopped at about 50% of the exhibits for under one minute.
In addition, it is commonly believed that the viewing time is largely influenced by "museum fatigue". In early studies, it was believed that museum fatigue was ascribed to the result of physical tiredness, which was reported by Gilman (1916) according to the study in the Boston Museum of Fine Arts. Later, Robinson (1928) and Melton (1935) found that it was ascribed to the psychological tiredness rather than physical causes. According to Melton, working mostly in various galleries in the Pennsylvania Museum of Art, the paintings on the shortest route between the entrance and the exit received the most attention, and the amount of time for viewing each painting decreased step by step towards the exit. Also he found that when a second row of paintings was added, a total viewing time was not so different from before, that is average viewing time on each painting in the gallery was less than before. From these results it can be said that psychological tiredness influences viewing time.

Thirdly, group visitor behaviour has been examined by many evaluators. In this section, the behaviour of school groups and guided tours are not discussed because their behaviour might be largely influenced by teachers and guides and therefore they are not regarded as general visitors. According to Diamond (1986), in the Exploratorium and Lawrence Hall of Science, groups tended to stay together throughout the visit and conversed with each other, and she thought this behaviour facilitated learning. Similarly, Koran, Koran, Foster & Dierking (1988), Niquette (1994) found that the choice of objects viewed could be influenced by the behaviour of other visitors, that is, if somebody stops to see an object, others also try to see the object. This behaviour might be frequently seen in groups. Also the investigation of family behaviour is one of the most important tasks for evaluators. This matter has already been discussed in a former section (pp123-126). In addition to these studies, as another approach to evaluation of group behaviour, McManus (1987) unobtrusively observed visitor behaviour at a range of exhibitions in the Natural History Museum, London (about 14,000 m²). The summary is as follows.
GROUP VISITORS' BEHAVIOUR

<table>
<thead>
<tr>
<th></th>
<th>COUPLES</th>
<th>ADULT GROUPS</th>
<th>ADULTS WITH CHILDREN</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH OF STAY</td>
<td>LONG</td>
<td>SHORT</td>
<td>LONGEST</td>
</tr>
<tr>
<td>READING TEXT</td>
<td>YES</td>
<td>UNLIKELY</td>
<td>UNLIKELY</td>
</tr>
<tr>
<td>CONVERSATION</td>
<td>UNLIKELY</td>
<td>UNLIKELY</td>
<td>YES</td>
</tr>
<tr>
<td>HANDS-ON</td>
<td>UNLIKELY</td>
<td>ONLY IF FEMALES</td>
<td>YES (VERY LIKELY)</td>
</tr>
</tbody>
</table>

Also she reported that female solitary visitors were more likely to interact with hands-on exhibits than male solitary visitors.

(D) WHAT DO VISITORS LEARN IN MUSEUMS

Museums are so-called educational institutions for the general public as well as specialists, aiming to offer them opportunities for life-long education. Therefore, to know the educational effects on visitors is a vital task for exhibition planners. Many studies have been reported so far, but they are problematic because "lack of visitors' learning tends to ascribe to the quality of the exhibitions rather than to the nature of the average museum visit" (Miles 1955). This means that many evaluators did not pay attention to the general visitors' characteristics which have been discussed in the former sub-section "what do visitors do in museums?" Other findings concerning visitor learning include those of Fothergill et al (1978:65) who reported on their study of 17 visitor centres in the UK. The main conclusion was that the study of visitors' learning failed to throw light on the real understanding which visitors may be gaining from the centre's interpretation. In other words, the design of the study must be the most effective in obtaining information about what visitors learned from the exhibition.
In addition to this, they found a lack of significant difference between the comprehension of "first-time" and "repeat" visitors. According to Diamond's (1986) studies at the Exploratorium (San Francisco) and the Lawrence Hall of Science (Berkeley, California), the results show no significant differences between repeat and first-time visitors in terms of visitors' general behaviour in museums. If so, it might be said that there are no significant differences between first-time visitors and repeat visitors in terms of their learning.

What is more, the nature of visitors learning can be divided into "affective learning" (experience-based learning) and "cognitive learning" (information-based learning). Traditionally, museum theory seems to pay less attention to affective learning. It can be said that museums should give visitors opportunities for well-balanced affective and cognitive learning. Although the study of what visitors learnt from exhibitions is difficult to achieve, the method must be improved using elaborated methods of questionnaire, interview and quiz for example.

(E) WHAT SORTS OF MEMORIES DO VISITORS RECALL?

Early studies of recollection in terms of museum learning did not focus on Tulving's (1972) seminal research on "episodic and semantic long-term memory". According to Tulving, long-term memory consists of two such kinds of memories. In short, the former is memory of personal events (e.g. where, when and how) and episodes, and the latter is memory for meanings. Miles (1995) suggests that although, several studies have taken this distinction into account, almost all the results of these studies have been about episodic memory. The examples includes Bitgood and Cleghorn's study (1994); Stevenson's study (1991) in Launch Pad in the Science Museum (London); and Mcmanus's study (1994) in the Birmingham Museum and Art Gallery (UK). This author's view is that although
their studies lacked investigation of semantic memory, their reports were also useful because an episodic memory might be a trigger to recall a semantic memory if a past visitor has any. Also if a past visitor only remembers a huge dinosaur's skeleton, this episodic memory is meaningful because she or he remembers roughly the size of a dinosaur which relates to semantic memory. In addition, a good episodic memory might make past visitors revisit the museum as well as similar museums, and it may make even them want to study the subject matter more fully.

In addition, to investigate past visitors' episodic and semantic memory, elaborated questions are needed. Following examples by this author might be helpful:

1. For episodic memory:
   What do you remember about your visit to the exhibition (or museum)?

2. For semantic memory:
   What did you learn from your visit?

CONCLUSION

Through several studies of visitors' experiences, this author concludes as follows:

1. Exhibitions must be set up considering lay visitors' learning.
   Lewis (1980) suggested that "the basic problem is that the meaning and significance of the exhibits tend to be almost completely lost on the generally uninformed lay visitors".

2. Visitors could learn under conditions of relative freedom and non-coercion and could experience self-initiated learning rather than imposed learning.

3. Visitors can understand a clear story line (Ibid) as well as browse pieces of information (Ogborn 1995).

4. Visitors can experience both affective learning and cognitive learning.
This chapter has examined so-called visitor studies which relate to the planning of educational exhibitions in general. This knowledge directly connects with how to set up effective exhibitions for environmental education. Firstly visitor studies in general were discussed in terms of their history and contents. Secondly, visitor studies were looked into from the psychological and sociological points of view. Psychology examined in this chapter included environmental psychology and cognitive psychology each of which is one of the vital subjects in visitor studies. Finally, practical issues on visitors studies were discussed.
DR ROGER MILES IS LECTURING AT THE MUSEUM VISITOR STUDIES IN THE 90S CONFERENCE IN LONDON, 1993 (PHOTOGRAPH: J. H. IGUCHI)
CHAPTER 4

RESEARCH FOCUS

AND

APPROACH

A SHOWCASE EXHIBITION AT THE PITT RIVERS MUSEUM, OXFORD IN THE UK IN THE 1990s

(MUSEUMS AND GALLERIES COMMISSION, 1992. MUSEUMS MATTER)
This thesis has already examined museum education in general (chapter 1), environmental education (chapter 2) and visitor studies for museum education (chapter 3). However, the core of this thesis is the main case study. The point of this research is to gain insights into creating effective educational exhibitions for ecology as parts of environmental education through museums. This chapter will discuss the main research focus and approach. It consists of an outline of the research methodology in general and for museum evaluation, analysis of other evaluations of the NHM (Natural History Museum, London), and finally the methodology for the main original case study of the Ecology Exhibition in the NHM. This will focus on detailed method including objectives, procedure and data analysis.

[1] OUTLINE OF THE RESEARCH METHODOLOGY

(A) METHODOLOGY IN GENERAL

a) MAIN STAGES OF RESEARCH

There are many views on the possible sequences for research in education, psychology and social science, and there is a great deal of overlap between the various approaches. This author suggests a form of amalgamation as follows.

1. Suggest general idea and read widely resources concerned.
2. Refine a topic and develop research questions.
3. Select and read literature on the discipline.
4. Establish the precise focus of the research and its aims and /or hypotheses.
5. Determine data needed (e.g. national, regional, local, institutional,
individual).

6. Decide the methods of data collection (e.g. survey, action research, case study / observation, questionnaire, interview).

7. Submit the project outline to the institution where the researcher is going to conduct the research and gain approval.

8. Do the research.

9. Analyse and evaluate the data.

10. Write up the project.

(Based on the following resources: Open University, 1979; Bastiani & Tolley, 1979:22; Howe & Lewis, 1993:11; Bell, 1992:16,46)

b) BROAD APPROACHES TO EDUCATIONAL RESEARCH

SCIENTIFIC METHODOLOGY

One broad group of research approaches can be characterized as "scientific". Definitions of science are problematic. "To some, science connotes a prestigious undertaking; to others, science implies a body of true knowledge; to still others, it means an objective investigation of empirical phenomena" (Frankfort- Nachmias & Nachmias, 1994:4). Some of the elements of the nature of science as seen by educational researchers are as follows:

1. **Determinism**: Events are determined by other circumstances and they are explicable in terms of their antecedents.

2. **Empiricism**: Certain kinds of reliable knowledge can only originate through experience.

3. **Principle of parsimony**: Phenomena should be explained in the most economical way possible.

4. **Generality**: A deductive or inductive method of reasoning can be
According to Frankfort-Nachmias & Nachmias, scientific methodology incorporates three rules. These are: rules for communication, rules for logical and valid reasoning, and rules for intersubjectivity. These three kinds of rules allow us to understand and predict our environments but other systems for producing information such as authoritarianism, mysticism, rationalism cannot allow us to do these (Frankfort-Nachmias & Nachmias, 1994:25).

ACTION RESEARCH

Action research has its own special features which distinguish it from conventional methodologies. Bastiani and Tolley suggest some special features of action research as follows:

1) It is committed to action, to the solution of problems and the improvement of practice, in a direct way. Its focus is upon practical issues identified by the practitioners themselves.

2) It requires a special relationship among researchers such as collaborative activity with a special kind of openness of styles.

(Bastiani & Tolley, 1979:33)

Cohen and Manion (1994:189) also suggest that "whenever a new approach is to be grafted onto an existing system, action research is appropriate".

CASE STUDY

The dictionary’s definition of case study is that it is "the study of the development of a person or group over a period of time (Hornby, 1990:174)." However often case studies are conducted not only about specific humans but also about some projects for example. The case study approach suits individual researchers because it allows the study of one aspect of a problem in some depth.
within a limited time scale (Bell, 1992:6). In addition, although case studies can allow researchers to generalise (Adelman, Jenkins & Kemmis, 1980), relatability is often more important than its generalisability (Bassey, 1981: 85).

Furthermore in any case studies in contemporary social science and educational research, the main method of data collection is observation (Cohen & Manion, 1994:107). "The purpose of such observation is to probe deeply and to analyse intensively the multifarious phenomena...with a view to establishing generalisations about the wider population to which that unit belongs" (Ibid: 106).

(B) DATA COLLECTION

a) DATA COLLECTION IN GENERAL

Educational research can be divided into experimental and descriptive. The former is when researchers arrange for events to occur, and in the latter, they account for what has already occurred (Best, 1970). However most educational research methods are descriptive because they look at individuals, groups, institutions and materials in order to describe, compare and analyse the entities and the events (Cohen & Manion, 1994:67). "Descriptive research includes longitudinal, cross-sectional and trend or prediction studies" (Ibid). The most commonly used descriptive method in educational research is survey which gathers data at a particular point in time in order to describe the nature of existing conditions (Ibid:83). In designing any survey, there are three important considerations: the exact purpose; the population focused upon; and the resources/data available (Hoinville & Jowell, 1978).
In addition, sample design is one of the primary tasks in data collection. In modern sampling theory, the basic sampling methods can be divided into probability sampling and non-probability sampling (Frankfort-Nachmias & Nachmias, 1994:174). In the former, the probability of selection of each respondent is known and in the latter, the probability of selection is unknown (Cohen & Manion, 1994:87). The summary of these sampling methods is shown below.

PROBABILITY SAMPLING

1. Simple Random Sampling: selecting subjects at random from the population under study so that each member of the population has an equal chance of being selected.

2. Systematic Sampling: selecting subjects from the population under study systematically rather than randomly. For example, if a sample of 100 is required from a population of 2000, then every twentieth person is selected.

3. Stratified Sampling: dividing the population under study into homogeneous groups, each containing subjects with similar characteristics, for example, group A contains male teenagers only and group B contains female teenagers only, then selecting subjects randomly from each group.

4. Cluster Sampling: selecting randomly a specific number of schools under study for example, and test all the children in those selected schools. This sampling might be suited if the population is large and widely dispersed. (Cohen & Manion, 1994:87,88)

NON-PROBABILITY SAMPLING
1. **Convenience sampling**: choosing the nearest individuals to serve as respondents.

2. **Quota sampling**: choosing representatives of the various elements of the population under study.

3. **Purposive sampling**: choosing representatives of the population under study subjectively.


Furthermore, sampling size must be debated. There is a formula of sampling size, but it is not included here. Although there are some simple sampling methods such as 5 percent of population under study for example (Frankfort-Nachmias & Nachmias, 1994:185), a sample size of thirty is often used as the minimum number if researchers intend to use some form of statistical analysis on their data. "though techniques are available for the analysis of samples below thirty" (Cohen & Manion, 1994:89,90). The smaller the sampling size, the larger sampling error, that is, if the sample size is relatively small, the mean of the samples is not representative of the mean of the population under study.

b) **OBSERVATION**

Depending on its purpose, there are various methods of observation. However, in general, planning the observation requires the following:

1. Decide exactly what kind of information is needed to be known.
2. Consider why this information is needed.
3. Think if observation is the best way of obtaining this information.
   (These 3 steps can be also used for planning questionnaires and interviews)
4. Decide the specific behaviour(s) to be observed.
5. Establish the reliability and validity (see pp146,147) of the observation.
Especially, consider unobtrusive methods; estimate the minimum observation time needed for accurate record; and devise a suitable checklist.

(Bell, 1992:99, Heyes, Hardy, Humphreys & Rookes, 1990:85)

c) QUESTIONNAIRE

Questionnaires are a good way of collecting certain types of information quickly and cheaply (Bell, 1992:58). However ideally questionnaires must be unambiguous and uniformly workable, and designed with minimum potential errors from respondents (Davidson, 1970). Frankfort-Nachmias and Nachmias suggest four types of question structure. They are as follows:

1. **Closed-ended question**: Respondents must choose the one that most closely represents their views.

2. **Open-ended question**: It is not followed by any kind of choice, and the answers can be recorded in full.

3. **Contingency question**: It applies only to a sub-group of respondents. The respondent can select the relevant question and continues to answer the filter question.

4. **Matrix question**: It organizes a large set of items such as rating questions that have the same response categories.

(Frankfort-Nachmias & Nachmias, 1994:267)

Some question items used frequently are as follows:

1. **List**: The respondent selects any items in the list which might be a simple list or a grid structure.

2. **Category**: The respondent selects one only in a set of categories.

3. **Ranking**: The respondent places something in rank order.

4. **Quantity**: The respondent answers a number (exact or approximate), giving the amount of some characteristics.

-144-
5. Rating: The respondent judges in terms of sets of ordered categories. *Semantic differential*, which is a kind of rating scale is frequently used. It measures the respondent's reaction to some object in terms of rating on bipolar scales with contrasting adjectives at each end (Frankfort-Nachmias & Nachmias, 1994:247, 249).

In addition, many authors of research methodology argue about questions which should be avoided in questionnaires. They are: leading questions, which "are worded so as to prompt the desired answer" (Hornby, 1990:708); offensive questions (e.g. asking respondent's exact age), (Bell, 1992:63); Threatening questions (e.g. asking respondent's bad habits), (Frankfort-Nachmias & Nachmias, 1994:254); Knowledge questions, which asks some information that the respondent may not know (Bell, 1992:62). Furthermore, hypothetical questions (Ibid:63), highbrow, complex and negative questions (Cohen & Manion, 1994:93) should be avoided.

d) INTERVIEW

The research interview is "a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information" (Cannel & Kahn, 1968). A major advantage of the interview is its adaptability, that is, opportunities delving into answers are greater than questionnaires. And also if interviewers are skillful, they can probe whether the interviewee's response is honest which the questionnaire can never do (Bell, 1992:70, Tuckman, 1972). However there are disadvantages, that is, interviews are time-consuming; and also they are highly subjective techniques leading to the danger of biased interpretations (Bell, 1992:70).
e) SECONDARY DATA ANALYSIS

"Secondary data analysis refers to research findings based on data collected by others" (Frankfort-Nachmias & Nachmias, 1994:291). These findings include census, public records and private records. In addition, in the discipline of social science, these findings include those of being collected by unobtrusive measures such as erosion measures - to measure natural remnants of some population's activity, for example, the wear on library books shows their popularity; accretion measures - to measure population's deposit of materials, for example, the amount of cans used for soft drink in bins is taken as an indicator of the frequency with which they were drunk; and also findings from simple observations (Ibid:291-311). The method of secondary data analysis is frequently used for historical research. The value of historical research is that it enables solutions to contemporary problems through the study of the past (using the method of literature survey and secondary data analysis) and it throws light on present and future trends (Hill & Kerber, 1976).

f) SOME ISSUES

RELIABILITY AND VALIDITY
Reliability and validity are vital considerations whenever collecting and analysing data. Reliability is the extent to which a test produces similar results under constant conditions on all occasions, and validity tells us whether an item measures what it is supposed to measure. "If an item is unreliable, then it must also lack validity" (Bell,1992:50,51).

Validity also can be divided into internal and external validity. The former may be jeopardized by intrinsic or extrinsic factors. Intrinsic factors account for changes in the individuals or the units studied during the research period.
such as changes in the measuring instruments, or the reactive effect of the observation itself. Extrinsic factors are called selection effects which are "biases resulting from the differential recruitment of respondents to the experimental and control groups (Note: experimental or treatment group is exposed to the independent variable and the control group is not)" (Frankfort-Nachmias & Nachmias, 1994:100,106,119). The latter, external validity, is the extent to which "the research findings can be generalized to larger populations and applied to different settings" (Ibid:120).

In addition to these, whenever analyzing secondary data or undertaking a so-called literature survey, a critical attitude to the data is important. A critique of documents can be divided into external and internal focus. The former aims to discover whether a document is forged or authentic, and the latter consists of rigorous analysis as much as possible such as what it actually says; if it is typical or exceptional of its type; and what known about the author is, such as his/her social background, political views, past experiences and aims for example (Barzun & Graff, 1977 quoted by Bell, 1992:55, 56).

PRIVACY
For the most part, an individual's right to privacy contradicts the public's right to know (Cohen & Manion, 1994:365). Hence, "right to privacy" may easily be violated during the investigation or after it has been completed (Ibid, Frankfort-Nachmias & Nachmias, 1994:93). The methods used to protect participants are anonymity and confidentiality (Ibid).

A code of Ethics for Social Scientists says that "research data should be confidential and all participants should remain anonymous, unless they have given permission for the release of their identity" (Ethical Dilemmas and Social Science Research, San Francisco, Jossey-Bass, 1979:443-448, quoted by
This sub-section discusses some methods of data analysis which closely relate to the main case study written up in later chapters.

a) DATA ANALYSIS IN GENERAL

Statistics are used as a tool in order to describe and analyse the results of practical work (Heyes, Hardy, Humphreys & Rookes, 1990:vii). Statistics can be divided into descriptive statistics and inferential statistics (Ibid:3-7). The former aims to describe simply the results with no explanation of the relationship between the cause and result, and no prediction of future trends. In contrast with this, the latter aims to analyse the result relating to the cause with, in most cases, conducting experiments, and predicts future trends.

The types of data are various depending on purposes. They are described below.

1. Nominal data: is the number of subjects or items.
2. Ordinal data: is the rank in a set of the results.
3. Ratio data/Interval data

: are commonly used for measuring instruments. "Ratio data has a logical zero point (e.g. weight machine), whereas zero on an interval scale is a purely arbitrary point (e.g. zero degree on the thermometer)" (Ibid:25,26).

In addition, qualitative variables relate to characteristics measured using nominal or ordinal scales, whereas quantitative variables relate to data measured using ratio or interval scales (Sandy, 1992:105).
The results will be described in the form of tables (this work is called tabulation) which are useful for raw scores; frequency distributions; and ranked scores. Graphs, pie charts, and bar charts (simple/compound/component/histogram) are also frequently used.

b) RANGE AND AVERAGE

The range and the average are often used to show the dispersion and central tendency of the data. The range is the difference between the lowest and the highest scores to show the dispersion (Heyes, Hardy, Humphreys & Rookes, 1990: 14). The average can be divided into 3 types, that is, the mode which is the most frequently occurring value, the median which is the middle value when the data are listed in order, and the mean is the sum of individual items divided by the number of items (Sandy, 1992:117,119).

The mode may be useful for nominal and discrete data, on the other hand, the median and the mean can be used for ordinal, interval and ratio data, however these data for calculating the mean should be distributed in a symmetrical or near symmetrical way to avoid distortion of results (Ibid:121).

These 3 types of average (mode/median/mean) have their own advantages and disadvantages. As Heyes, Hardy, Humphreys and Rookes (1990:11,12) suggest they are as follows:

1. The mode is easy to work out, but has limited meaning when there is not much difference in the frequency of the scores.
2. The median is usually easy to calculate and more representative than the mean when there are extreme scores. However it shows less information than the mean since it does not use the precise numerical values.
3. The mean involves the individual values of all, however it is difficult to calculate when the number of the data is large and less representative.
than the median if there are extreme scores.

c) STANDARD DEVIATION

"The standard deviation is a measure of the distribution of scores around the mean. A large standard deviation means that there is a wide scatter of scores whereas a small standard deviation means that most scores are very close to the mean value" (Heyes, Haldy, Humphrey & Rookes, 1992:87). The formula is that:

\[ S^2 = \frac{\sum (X-\bar{X})^2}{N} \]

\[ S = \sqrt{\frac{\sum (X-\bar{X})^2}{N}} \]

S^2 : variance  
S : standard deviation 
X : each individual data  
\bar{X} : the arithmetic mean 
N : the total number of data

* If samples are regarded as whole population under study, N is used. On the other hand, if samples are selected from whole population under study to predict the standard deviation of this population, (N-1) is used.

In addition to this, in the mathematical property of the normal distribution of the standard deviation, approximately 68% of all scores lie between ±1 standard deviation from the mean \( \bar{X} \), similarly 95% lie between±2, and 99% lie±3 standard deviation from the mean \( \bar{X} \).

d) STATISTICAL TESTS

There are various methods of calculating statistical tests. However this thesis looks into two major methods: Chi squared \( \chi^2 \) test and Unrelated t test which are used in main case study.
Chi squared ($\chi^2$) test

This is a statistical value using percentages, and the coefficient is represented by the "p" which shows that "if "p" is 5% (0.05) or smaller, the result is said to be significant" (Heyes, Hardy, Humphreys & Rookes, 1990:70).

The procedure of calculating and the formula are as follows:

1. Place the data into a box table which consists of some boxes.
2. Calculate each column total and row total, and work out grand total.
3. Calculate the expected frequencies (E) for each box. The formula is below:

\[
E = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}}
\]

4. Calculate the degrees of freedom (df) using the formula that:

\[
df = (\text{number of rows} - 1) \times (\text{number of columns} - 1)
\]

5. The formula of $\chi^2$ is as follows:

\[
\chi^2 = \sum \frac{(0 - E)^2}{E}
\]

If df > 1

\[
\chi^2 = \sum \frac{(|0 - E| - 1/2)^2}{E}
\]

6. Find the value of "p" using a Chi squared table.

Unrelated t test

This test determines the probability that the difference between the two conditions such as sexes is significant (Ibid:57). The formula of the coefficient "t" is below:
\[ t = \frac{\sqrt{[\sum A^2 - (\sum A)^2/Na] + [\sum B^2 - (\sum B)^2/Nb]} \times (1/Na + 1/Nb)}{(Na-1) + (Nb-1)} \]

A: raw data in condition A
B: raw data in condition B
Na: the number of subjects in condition A
Nb: the number of subjects in condition B
\[ \bar{A} = \frac{\sum A}{Na} \]
\[ \bar{B} = \frac{\sum B}{Nb} \]

df (the degree of freedom) = (Na-1) \times (Nb-1)

Then find out whether the result is significant using the \textit{t table}.

In addition, the result which shows its own significant is not 100% correct.
There are two types errors that is:

1. \textit{Type 1 error}: A significant result may include a small possibility of chance.

2. \textit{Type 2 error}: A result that is not significant may include a small possibility that the result was not due to chance.
   (Ibid:71)

(D) \textbf{EVALUATION METHODOLOGY FOR EXHIBITIONS}

On the basis of previous discussions, this sub-section focus on methodology related to evaluation of exhibitions, and explores some of the issues raised in
"The Design of Educational Exhibits" (Miles et al, 1988: 127-170).

a) MUSEUM EVALUATION IN GENERAL

SOME ISSUES
In short, "evaluation is an activity that seeks to assess the worth or merit of things" (Miles et al, 1988:127). Social scientists consider that evaluation aims to assess worth or merit of things with certain scientific criteria objectively and rigorously. This rigour makes such evaluations sometimes unpopular with developers. Especially in the museum world, some staff still think that museums are repositories for objects, and should not be used to display concepts or ideas. Hence in some museums, evaluation of exhibitions is unpopular. Another reason for underplaying such evaluations is that museum staff can be anxious of the results which might recommend a renewal of an exhibition and they suppose that the exhibition developers are doubted in terms of their knowledge and technical ability. Because of the sensitivity of this matter, the report of the recommendations must be professionally undertaken by the evaluator(s).

HOLISTIC AND ATOMISTIC EVALUATION
Museum evaluation tends to lean towards either a holistic or an atomistic view - or macro or micro view (Miles et al, 1988:144). The aim of the holistic view is to "discover what happened when the public was let loose on an exhibition," and "whether the public thinks it is getting or is going to get what it wants from the exhibitions presented" (Ibid). On the other hand, the aim of the atomistic view is to evaluate individual exhibits, and labels, panels and other written elements. It can be seen that a holistic view relates to summative evaluation and an atomistic view tends to relate particularly to formative evaluation. Formative evaluation however can only predict what presumably will not work, and
saying the reason using mock-up exhibits for example. On the other hand, summative evaluation can discover the facts of visitors' behaviour in real exhibitions through the method of unobtrusive observation for example.

b) DATA COLLECTION

This chapter has already looked into the three main techniques of data collection of observation, questionnaire and interview. Additionally, some important issues related to interviews in terms of exhibitions must be considered.

Firstly, interviewees' opinions stated can differ from their "real" opinions. For example, when asked if an exhibit was attractive, a respondent tends to answer that it was attractive, that is positive answers. This psychological effect is known "response set" which means "a readiness to respond to a stimulus" (Reber, 1985:690).

Secondly, the answers by interviewees tend consistently to be overrated or underrated because the answers are influenced by the degree of the respondents' interest in the subject asked. This psychological effect is known as the "halo effect". Drever (1972:115) suggests that "it is a frequent source of error in employing rating scale and similar procedures."

In addition, the technique of interview can be divided into two stages such as asking permission to be an interviewee and conducting the interview itself. About the former, "the opening remarks made by the interviewer are crucial if those who are less willing to co-operate" (Miles et al, 1988:160). In the latter, in semi-structured and structured cases, interviews must be carried out uniformly in asking questions.
PRACTICAL SAMPLING METHODS

Based on discussion about theoretical sampling methods in the former section (see pp142, 143), further discussion on practical sampling methods relating to museum evaluation is vital.

The fundamental question concerning sampling is the definition of the population out of which samples are taken. One method of sampling visitors to yield a representative of the population under study is to count visitors when they enter the exhibition and then select each "kth" visitor to be interviewed. This procedure is easy if only sufficient numbers of interviewers can be available. However "strictly speaking, this sampling procedure is not random ..., but we can regard the method as approximately equivalent to random sampling if we assume there is no order in which people visit an exhibition" (Ibid:155).

c) DATA ANALYSIS

Some methods of data analysis has been already discussed (see pp148-152). Additionally, standard error is introduced which will be used for analysing the main case study in later chapters.

STANDARD ERROR

The following are some practical examples for museum evaluation using standard error (Miles et al, 1988:150,151).

Example 1:
An estimate of the standard error is:

\[
S_{\text{error}} = \frac{S}{\sqrt{n}}
\]

S: standard deviation
n: number of samples
Each visitor in a random sample of 100 was asked how many galleries he/she had visited, and the following result was obtained for example.

\[ X = 4.06 \text{ galleries}; \quad \text{Therefore standard error } S_{\text{error}} = \frac{2.02}{\sqrt{100}} = 0.2 \]

\[ S = 2.02 \text{ galleries}; \quad \text{If using the theory which } 95\% \text{ of all values in a} \]
\[ N = 100. \quad \text{normal distribution lie between } \pm 2 \text{ standard} \]
\[ \text{deviation from the mean (see p150),} \]
\[ \therefore \text{the sample means } = 4.06 \pm 2 \times 0.2 \]
\[ \text{That is, the sample means lie between 3.66 and 4.46 galleries, } 95\% \text{ with confidence limit.} \]

Example 2:

Another formula of standard error is:

\[ \sqrt{pq/n} \]
\[ p: \text{ the proportion of visitors having the attribute.} \]
\[ q: \text{ the proportion not having it.} \]
\[ q = (1-p) \text{ or } (100-p) \text{ if } p \text{ is described as } \% . \]

If 40 \% of 400 visitors selected randomly have visited the museum before, then
\[ n = 400, \quad p = 40 (\%), \text{ and } q = 100-40 = 60 (\%); \text{ and} \]

\[ S_{\text{error}} = \sqrt{40 \times 60/400} = \sqrt{6} = 2.45 \]
\[ \therefore \text{the sample means } = 40 \pm 2 \times 2.45 \]
\[ \text{Therefore, the sample means lie between 35.1 and 44.9 } \%, 95 \% \text{ with} \]
\[ \text{confidence limit.} \]

d) SIGNIFICANCE OF REPORT

The final report including the results and recommendations is a powerful tool to
show the exhibition developers the researcher's efforts and ideas. "Whether or not the evaluator is successful in getting his/her recommendations accepted will depend upon a number of factors which include:

1. the intelligence and breath of knowledge the evaluator has brought to bear in solving the problems in hand;
2. the technical ability of the evaluator in defining the problem and designing the study competently;
3. the sensitivity of the evaluator in understanding the issues involved and the implications of the data collected" (Ibid:168)

Nisbet and Entwistle (1970, quoted by Sandy, 1992:127) point out that "it is unnecessary to describe in detail any standard tests or procedures that are well known." However this paper has discussed briefly the basic research methodology in general to reduce any description about statistics for example in the later chapters which include the main case study.
A) STRATEGIES FOR ENVIRONMENTAL EDUCATION AND EXHIBITIONS

The NHM (Natural History Museum, London) published a report entitled the "Corporate Plan 1992-97" (The Natural History Museum 1992a). This report discussed includes the wide range of museum strategies in the past and the future. For instance there were sections of their mission, the review, the targets for 1992-93 and financial resources. This sub-section discusses some issues raised by within this report in terms of environmental education and exhibitions (see also pp36,37).

a) KEY OBJECTIVES FOR EDUCATION AND EXHIBITIONS

KEY OBJECTIVES OF EDUCATION

"To complete the development of an educational programme tailored to the needs of the National Curriculum and stimulate interest in natural history" (The Natural History Museum 1992a:4).

KEY OBJECTIVES FOR EXHIBITIONS

"To improve the level of maintenance in the galleries; and to provide a comprehensive series of permanent exhibitions which are up-to-date and relevant to visitors' needs" (Ibid).

This museum emphasizes the significance of exhibitions in terms of education for
the general public because most visitors have not been educated to any extent in biology or geology. Hence most of galleries are designed to explain the subject scientifically in an effective way with the most appropriate media for non-specialists. In addition, the Museum provides a substantial educational service for children, and field excursions as well as some more detailed exhibitions for adults. Apart from education, the Museum provides some very good facilities for the public, such as an information service, shops and restaurants since most visitors see their visit as a leisure time activity.

5) SOME STRATEGIES FOR ENVIRONMENTAL RESEARCH AND EDUCATION

STRATEGIES IN THE PAST

Of the strategies for environmental research and education in the early 1990s, external collaboration with appropriate organisations and individuals has been one of the more effective ways. This example includes the meeting on biodiversity with the Department of Environment in the UK; the study of biodiversity of soil organisms with University of London; the development of the European databases for endangered species through the World Conservation Monitoring Centre; and the negotiation of a research programme on biodiversity in Belize with the Government organizations, and NGOs (Non-Government Organisations), (see also pp51,52).

In addition to this, recently, external funding for the NHM has been increasing comparing with a decade ago, from £15,000 in 1982 to £1,000,000 in 1992. Both numbers of externally funded staff and the funding in 1991/1992 have concentrated on research into biodiversity and environmental quality as shown in Figure 4.1 below.
Fig 4.1

(a) Numbers of externally funded staff in 1991-92:

扬尘: Directly relates to environmental education

(b) External funding (£'000) apportioned to programmes:

Data from "CORPORATE PLAN 1992-97"
THE NATURAL HISTORY MUSEUM, 1992:p7
FUTURE STRATEGIES

As future targets for research on biodiversity, the Museum has decided to enhance the sustainable use of tropical forests in Central and South America, and to undertake the research on soil biodiversity in temperate and tropical regions. Also the Museum will publish two big projects such as: *A New Lichen Flora of the British Isles* as the culmination of a project part-funded by the Natural Environment Research Council; the first volume of *Flora Mesoamericana* (Central America) in collaboration with the Missouri Botanical Garden and the Universidad Nacional Autonomia de Mexico. In terms of environmental quality, the biota (fauna and flora) and chemistry of groundwater in Kenya and Mexico will be researched. Also the evolution of protists (also called monads - living organisms with a single cell, e.g. protozoa) as environmental indicators will be enhanced to study. All these researches will contribute to the improvement of the world environment directly or indirectly.

ECOLOGY EXHIBITION

The Ecology Exhibition sponsored by BP (British Petroleum) was opened in 1991. The exhibition was intended to be very relevant to current environmental issues. According to a survey of visitors carried out by an independent market research company, the exhibition was rated the most popular of the Museum's exhibitions. This matter will be discussed in the next section.

(B) VISITOR SURVEY IN 1991

Visitor surveys are fundamental and vital investigations in museums and traditionally the majority of museums have carried them out and will continue to do so in order to ensure museums meet visitors' needs. The main source for this sub-section comes from the report "Natural History Museum, Visitor Survey 1991" (Creative Research Ltd 1991), and this thesis discusses the parts of this report
relating to visitor study and especially environmental education.

a) INTRODUCTION

Some visitor surveys in the NHM (Natural History Museum, London) were also intended to provide a wide variety of numerical information on visitors for designing appropriate exhibits and services within the Museum. This 1991 visitor survey aimed to look into how visitors' profiles had changed in the past decade. In this period, the Museum had undergone many changes such as the merger with the Geological Museum in 1985, the introduction of charges in 1988 and the restructuring of some exhibitions. In order to compare the 1991 survey with previous surveys, the following reports were used:

2. MORI 1988, "A MORI study of visitor attitudes".

b) METHOD

Some 305 structured interviews were carried out with group visitors (i.e. 305 groups) who just crossed an imaginary line to leave the Museum. Certain groups were omitted from this survey. These were: "museum staff or suppliers; people visiting Museum staff; non-English speaking visitors; visitors aged under 11" (Creative Research Ltd 1991:3).

c) DEMOGRAPHIC PROFILES

The demographic profiles of visitors had changed very little over the period, 1981 to 1991. The parts of the results in 1991 are as follows:

1. Male visitors were slightly more than females.
2. The bulk of the visitors were under 11 year olds and between 25 and 44.

3. 41% of visitors were in social class A and B (Note: 17% of UK population is in social class A and B - see Appendix 4). These results are shown in Figure 4.2 (p164).

4. One third had a biological science qualification, the majority of which were at GCSE levels (General Certificate of Secondary Education, for 14-16 year olds). These results are shown in Figure 4.3 (p165).

This report says that the reason for the bulk of under 11 year olds is that they are likely to visit museums through school trips or family trips (Note: they were not interviewed).

The investigation of the visitors' cultural activities relating to museum and natural history shows that: 80% of respondents watched or listened to television or radio programmes on natural history; 76% of them visited a local museum; and 72% of them also visited a major national museum. These results compared with the case of 1988 are listed in Figure 4.4 (p166).

d) MUSEUM VISITING

The respondents were asked how many times they had visited museums. According to the results, 45% of the respondents visited more than 3 museums in the previous year. The results are charted in Figure 4.5 (p167).

Also the total number of visits to the NHM is shown in Figure 4.6 (p168). The results do not form normal distributions, that is, the data was positively skewed by the very frequent visitors. Hence the median may be more representative.
<table>
<thead>
<tr>
<th>Year</th>
<th>1981</th>
<th>1988</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>605</td>
<td>660</td>
<td>305</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>56</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>Female</td>
<td>44</td>
<td>49</td>
<td>48</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 11</td>
<td>25</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>11-16</td>
<td>5</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>17-20</td>
<td>10</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>21-24</td>
<td>12</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>25-34</td>
<td>24</td>
<td>-</td>
<td>23</td>
</tr>
<tr>
<td>35-44</td>
<td>11</td>
<td>-</td>
<td>21</td>
</tr>
<tr>
<td>45-54</td>
<td>7</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>55-64</td>
<td>4</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>65+</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Social Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>-</td>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td>Cl</td>
<td>-</td>
<td>37</td>
<td>34</td>
</tr>
<tr>
<td>C2DE</td>
<td>-</td>
<td>23</td>
<td>26</td>
</tr>
</tbody>
</table>

Based upon data from NATURAL HISTORY MUSEUM, VISITOR SURVEY 1991, CREATIVE RESEARCH LTD: p10
ACADEMIC SCIENCE QUALIFICATIONS
OF INTERVIEWEES IN THE NHM

Fig 4.3

SCIENCE IN GENERAL
No 49%
Yes 51%

BIOLOGICAL SCIENCE
No 70%
Yes 30%

GEOLOGICAL SCIENCE
No 86%
Yes 14%

Based upon data from NATURAL HISTORY MUSEUM
VISITOR SURVEY 1991, CREATIVE RESEARCH LTD: P14
### CULTURAL ACTIVITIES OF INTERVIEWEES IN THE NHM, LONDON

#### Table 4.4

<table>
<thead>
<tr>
<th>Activity</th>
<th>% Participating</th>
<th>1988</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watched or listened to television/radio programmes on art/history/archaeology</td>
<td></td>
<td>72</td>
<td>85</td>
</tr>
<tr>
<td>Watched or listened to television/radio programme on natural history</td>
<td></td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Visited a local museum</td>
<td></td>
<td>64</td>
<td>76</td>
</tr>
<tr>
<td>Visited an historical monument</td>
<td></td>
<td>65</td>
<td>73</td>
</tr>
<tr>
<td>Visited a major national museum</td>
<td></td>
<td>71</td>
<td>72</td>
</tr>
<tr>
<td>Visited an art gallery</td>
<td></td>
<td>59</td>
<td>56</td>
</tr>
<tr>
<td>Been to a concert of classical music</td>
<td></td>
<td>37</td>
<td>45</td>
</tr>
<tr>
<td>Borrowed a book on art/history/archaeology from a library</td>
<td></td>
<td>32</td>
<td>37</td>
</tr>
<tr>
<td>Been to the opera or ballet</td>
<td></td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>Borrowed a book on natural history from a library</td>
<td></td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Been to a lecture on art, history or archaeology</td>
<td></td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Been to a lecture on natural history</td>
<td></td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>None of these</td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

*Data from NATURAL HISTORY MUSEUM VISITOR SURVEY 1991, CREATIVE RESEARCH LTD:* p12

*: Directly relates to environmental education

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-166-
NUMBER OF MUSEUMS VISITED BY INTERVIEWEES IN THE NHM

More than 3 museums in last year

45%

1 or 2 in last year

25%

Last visited museum over 4 years ago

13%

Last visited museum 1-4 years ago

18%

Based upon data from NATURAL HISTORY MUSEUM

VISITOR SURVEY 1991, CREATIVE RESEARCH LTD: P17
In addition to this, a greater proportion of the visitors in 1991 were family groups, but conversely in 1981, the proportion of solitary visitors or friendship groups were great. The report suggests that this difference may be due to the timing of the interviewing. For the 1991 survey that was within the school holiday period.

Furthermore, the proportion of overseas visitors in 1991 was 20%, whereas in 1981, this was 41%. The report suggests that possible reasons for this decline include: "the Gulf War; inclement exchange rates; the effects of introducing charging for admission; and sampling fluctuations" (Creative Research Ltd, 1991: 32).

e) LENGTH OF A VISIT

The average length of a visit in 1991, which is 2 hours 15 minutes by median, has roughly doubled since 1981. The possible reasons for this, according to the report, are that: the introduction of charges for admission; greater impact of renewed exhibits; and the merge with the Geological Museum. This figure is shown as follows in Figure 4.7 below.
**f) POPULAR EXHIBITIONS**

In general, this survey shows that biological exhibits are more popular than the geological exhibits and interactive exhibits (touchable and manipulable exhibits) are more popular than the theoretical exhibits (e.g. objects in glass cases with labels).

In addition, there are some clear differences between the sub-groups of the sample. For example, Dinosaurs and Creepy Crawlies (arthropods) are much more popular among children, while the Story of the Earth (astronomy and earth science), British Fossils, and Origin of Species (evolution theory) are more popular among visitors having some science qualifications. The top 5 popular exhibitions out of around 30 are: Ecology (26%); Mammals (25%); Human Biology (24%); Story of the Earth (19%); and Dinosaurs (15%). Most of these exhibitions seems to be more interactive than others.

**g) ECOLOGY EXHIBITION**

Visitors were asked general comments on exhibitions. Of all exhibitions in the
NHM, the Ecology Exhibition relates most to environmental education. Compared with the other exhibitions in terms of the design, good layout and use of space, its professional-looking and well-designed characteristics were particularly reported. These results are shown in Figure 4.8 below.

**GENERAL COMMENTS ON THE ECOLOGY EXHIBITION BY VISITORS**

<table>
<thead>
<tr>
<th>Items</th>
<th>(%)</th>
<th>Ave. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good layout/use of space</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>Professional-looking/well-designed</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Good for children/learning</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Effective Films/TVs/AVs</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Good display/Presentation</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Buttons to press/interactive</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Informative</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Basic explanations</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

**NOTE:**

Respondents (N) for the Ecology Exhibition is 54 (total N for all exhibitions is 305)

Ave. (%) - average percentage for all exhibitions.

Based upon data from the NATURAL HISTORY MUSEUM, VISITOR SURVEY 1991, CREATIVE RESEARCH LTD: P48

Also this survey investigated specific comments on each exhibition in terms of
its content. About the Ecology Exhibition, the most effective section or explanation for visitors was human effects on the earth (24%); and the least was the deliberate use of fossil fuels and resources (7%), which was one of the explanations of human effects. Although this issue was described on the film in the last section, it was not so effective for visitors. The possible reason was not argued on this report. Hence it might be worthwhile to investigate this matter in the main case study in this thesis. Also some quotations - like proverbs by wise men - on the walls was not so popular.

In addition to this, the profiles of visitors to the Ecology Exhibition were that the bulk of visitors' ages was 25 to 34, and the majority of visitors were members of a group such as a family or a friendship group.

The discipline of ecology probably seems novel and complex to the public. Hence most respondents wanted more basic explanations on this exhibition. On the other hand, the popularity of the exhibit among young adults between 25 to 34 was, in part, arguably attributed to the very nature of ecology such as novel and complex characteristics. Furthermore human effects on the earth which had the greatest impression on respondents is probably successful because this issue relates directly to environmental education.

(C) HISTORICAL VIEW OF THE EVALUATION OF EXHIBITIONS

a) MUSEUMS' ASPIRATIONS

In the 1970s, the NHM began to move away from conventional exhibitions since those existing exhibitions were thought to be dull and irrelevant (Miles & Tout, 1991:543). At the same time, the Museum began to produce educational exhibitions of modern biology having everyday significance. These included exhibitions of "Human Biology" and "Ecology" particularly for the Museum's lay
audience (Miles R.S. 1988:24). In order to do so, Miles implies that museums generally have the following aspirations:

1. Visitors should feel at home, with no sense of intimidation or coercion.
2. Visitors should be able to learn from the exhibits if they so wish, and the exhibits should be designed to facilitate learning.
3. Visitors should be able to leave without feeling guilty if they do not wish to learn. (Ibid:25)

In order to communicate the concepts of subject matter, the exhibitions were designed:

1. from the concepts to be communicated rather than from the gallery space to be filled;
2. with well-defined aims and objectives;
3. with the subject matter divided into easily managed chunks, organised in a clear logical sequence;
4. using a variety of media of communication embracing hands-on (interactive) and dynamic exhibits; and
5. with a range of supplementary materials for use either within or outside the museum (Miles & Tout, 1991:543).

According to the above-mentioned principles, from 1977 to 1986, eight exhibitions had been opened within the NHM, most of which were designed for the general public and the level of the vocabulary was for 15 years olds. These exhibitions included "Introducing Ecology" which was opened in 1978 (Ibid).

b) EVALUATION DEBATE

In early research on exhibits, summative evaluation for the Human Biology exhibition for example was applied, but this approach did not work (Miles R.S.
Some disadvantages of summative evaluation were discovered. Firstly, in early research, these studies were not in sufficient depth, so the reports were not able to suggest valid recommendations. Consequently, recommendations for the orientation system (maps, signposts, etc) for the "Origin of Species" exhibition in 1981 did not come from the summative evaluation carried out but came from the literature of psychology (Miles & Tout, 1991:544). Secondly, although, recently the method of summative evaluation has been improving, inevitably some psychological pressure on the group of the exhibition designers has to be seriously considered. In order to avoid this problem, if recommendations are too bland, they fail to carry conviction (Miles R.S. 1988b:27). Hence formative and front-end evaluation are worth-while to produce exhibitions with less faults in order to save the museum budget, and also to avoid the conflict generated within the museum staff. Consequently, summative evaluation was largely replaced by formative evaluation using mock-up exhibits during development and front-end evaluation for audience analysis during planning (Miles & Tout, 1991:544).

Formative evaluation in the NHM is carried out by the design team during the development of the exhibition, so reputations are not at stake. However, this evaluation still has problems. Firstly "it is time consuming no matter how rough and ready a procedure is adopted" (Miles R.S. 1988:29). Secondly, the theoretical basis of the procedure is not enough to produce effective exhibitions (Ibid). Therefore it is vital to gather the strongest possible theoretical knowledge from psychological and educational technology, and this knowledge can be used for front-end evaluation similar to market research before practical work is carry out (Ibid:30).

c) IDEAL EXHIBITIONS
In the early study of what the visitor conceives to be an ideal exhibit by Alt and Shaw in the Hall of Human Biology exhibition (1984), they were able to identify characteristics which visitors felt made for an ideal exhibition. These formed a spectrum from positive to negative attributes as follows.

**POSITIVE**

- Makes the subject come to life.
- Makes its point quickly.
- For all ages.
- Memorable.

**NEGATIVE**

- Badly placed.
- Not enough information.
- One’s attention is distracted by other displays.
- Confusing. (Alt & Shaw, 1984: 25-36)

In addition to this study, Griggs (1990) researched into seven exhibitions within the NHM and found some characteristics to be generally desirable and undesirable. These are listed below.

**DESIRABLE CHARACTERISTICS**

- Well-designed sequence.
- Using a lot of modern display techniques.
- Using familiar things and experiences.
- Including a comprehensive display of objects.

**UNDESIRABLE CHARACTERISTICS**

- Subject-matter is not sufficiently explained.
- Exhibits are not realistic enough.
- Appealing to children but less to adults.
- Old-fashioned.

By all these experiences of studies which have been done, the Museum emphasizes the importance of affective as well as cognitive objectives, and tries to change the image of museums for the general public from storehouses of artefacts to a place where visitors find new vistas opening up (Miles & Tout, 1991:547).
Although nearly all exhibitions in the NHM (Natural History Museum, London) relate to environmental education, however the Ecology Exhibition opened in 1991, is the closest to this subject. Hence analysis of the Ecology Exhibition in terms of environmental education is highly relevant and worthwhile. This section discusses existing studies of the Ecology Exhibition, one a front-end evaluation and the other a summative evaluation.

(A) FRONT-END EVALUATION (see p93)

A front-end evaluation was carried out in 1988 by a professional evaluation group – the Susie Fisher Group. The basis for this sub-section comes from their report "Ecology & The Public - Testing the Waters" (The Susie Fisher Group, 1988 :i-xiii,1-29).

The Museum planned to renew its existing ecology exhibition because it was not seen to be effective. Its new target audience was mainly non-specialist in their leisure time, but also encompassed more motivated repeat visitors. A front-end evaluation therefore was vital to identify how the public currently related to ecology in order to set up a more relevant exhibition for a variety of audiences. The research objectives were:

1. to identify the levels of understanding of ecology,
2. to assess the levels of interest in ecology as a subject, and
3. to find out how far the visitors had grasped the "Lifeforce storyline"

(which was presented to respondents), to enable these results to be
used as a springboard for future developments.

a) METHODOLOGY

SAMPLING
Five mini-group discussions and one hundred short, ten minute interviews were conducted with visitors excluding anyone who was not interested in visiting the Ecology Exhibition, and foreigners. In the group discussions, the visitors with science qualifications beyond "A" level (senior high school level in Japan and USA) were excluded.

STIMULUS MATERIALS
Some stimulus materials were used and are listed below.

- Boards illustrating some aspects of ecology
- Photographs of the impacts of pollution
- Some ecological problems on index cards
- Bubble drawings and pens and paper for "projective techniques" (1)
- A statement of the "Lifeforce storyline"
- Illustrations of possible ecology exhibition designs

(1) Projective Technique (a technical term in psychology): a cover term for any test, device or set of procedures designed to provide information about or insight into an individual's personality by allowing a respondent the opportunity to respond in an unrestricted manner to unstructured or ambiguous objects or situations (including Rorschach Test, and TAT - Thematic Apperception Test). (Reber 1985:581).
The fundamental research objective, "to identify the level of understanding of ecology" required a qualitative approach because this allowed visitors to articulate their understanding. In general, ecology can evoke positive and negative feelings, so these were looked into using projective techniques with a number of different bubble cartoons. Also "The lifeforce storyline" with photographs was presented to discuss very simple topics as well as the scientific terms such as trophic level\(^{(2)}\), detrivores (decomposers e.g. bacteria) and ecosystem. In the short interview, especially, each respondent were asked to look at the list of contemporary ecological issues and to place them on the motivation map (coordinates - see Fig 4.10: p179).

b) OVERVIEW AND RECOMMENDATIONS

Through this research, the researchers found some important evidence about how visitors understand ecology. First of all, the term ecology was too nebulous and too wide for them. Also it was thought of as a piece of scientific jargon, associated with biology text books for pupils or students, rather than their lives. Consequently, ecology was loosely associated with the environment and its conservation. The level of visitors' knowledge on ecology is shown in Figure 4.9 (p178).

Secondly, to know what current ecological issues were interesting for visitors, they were asked to place a number of issues presented on the map which was segmented vertically, interesting to boring, and horizontally, worthy to trivial /superficial. The result showed that the most interesting issues for them

---

(2) Trophic levels: Different layers of a food chain, each containing organisms which get their food and energy from similar sources (Spurkeon 1988:47).
directly concerned their own lives such as "disposing of aluminum soft drink cans carefully" and "junk food/wholemeal food", and also vast ecological world issues such as "disappearing rainforest". However visitors were indifferent to those issues concerned indirectly with their lives such as "turning an electric light on" and "choosing a new front door." The "map" is shown in Figure 4.10 (p179).
Thirdly, although man's negative impacts on the environment was interesting for them, the emotion and energy concerning this issue was limited except for some environmental enthusiasts. Perhaps an overdose on social issues of man's negative impacts on the environment made visitors feel uncomfortable, guilty and impotent, and finally they switched off on this issue. The visitors felt that man's destruction of the environment was not their responsibility. One of the comments relating to this argument is quoted below (Note: transcripts from interviews shown in this report are quoted directly below, hence they might include some slang).

"The Government does have a responsibility as the electing body, they are supposed to be serving the best interests of the people. Also I think large industries have a responsibility, they are belching all this guff into the atmosphere day after day" (Parents of kids aged 8-16 years).

(The Susie Fisher Group, 1988:11)

The result of this argument was illustrated graphically as shown in Figure 4.11 blow.

**RESULT OF OVERDOSE ON SOCIAL ISSUES**

**BY VISITORS, THE NUM**

![Diagram showing the result of an overdose on social issues](image-url)

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Data from The Susie Fisher Group 1988

"Ecology & The Public - Testing The Waters" p:9

-180-
Lastly, the basic concept of "Lifeforce storyline" was effective although some technical terms made respondents confused. The first part "life", which the main theme was to need energy and food for all living things for their life process, was very popular. The middle parts such as photosynthesis and ecosystem were unpopular due to technical terms as well as being like school work for teenagers. The last part, environment and man was popular. The result is shown as a map of levels of interest in each part of the "Lifeforce Storyline" in Figure 4.12 below.
In addition, as a reaction to the "Lifeforce Storyline" designed for the Ecology Exhibition, school children particularly hoped to be provided with some hands-on exhibits. Some interviews recorded to support that suggestion are given below.

"The best things in an exhibition are the models and displays, things you can touch" (Boys, 15-16 years);

"...if it is just a sheet of writing, you will just walk past. You can touch buttons and ask questions" (Boys, 15-16 years).

(The Susie Fisher, 1988:22)

RECOMMENDATIONS

Some recommendations made by evaluators are listed below.

To prevent arguably present day public apathy towards ecology, any new ecology exhibition should:

• provide tools for constructive action, without preaching;
• give an undercurrent of optimism - it is not all too late;
• offer relevant content to the public and focus on issues close to their lives;
• show the novelty of living things;
• be dramatic and dynamic; and
• offer opportunities to see and hear as well as touch and smell the ecological world.

c) DISCUSSION (by this author)

This research is not only geared to the production of effective ecology exhibitions, but also the results are relevant to environmental education in general. Within some useful results, the following should be taken into
account, that is:

1. An overdose of man's negative impacts on the environment made visitors feel guilty and they switched off on this issue (i.e. a form of psychological repression). This is arguably a very curious finding and has a negative tendency towards conservation of the environment. It is worth further investigation.

2. Visitors thought that man's destruction of the environment was not their responsibility but that of employers and Government. However, apparently, causes of pollution for example are not only due to the policies of employers and the Government, but due to all man's activities. If this visitors' idea represents the whole public's, it will be also dangerous. Again further investigation on this issue is worthwhile.

(b) SUMMATIVE EVALUATION (see p94)

In 1991, a summative evaluation of the Ecology Exhibition in the NHM (opened in March 1991) was conducted by a research student alongside the Museum's staff. It was the first case of a systematic summative evaluation of this exhibition. This sub-section will describe and discuss this evaluation. The source for this comes from "Ecology an Evaluation" (The Natural History Museum 1991a).

EXHIBITION OBJECTIVES

According to the results of the front-end evaluation, the exhibition objectives were decided as follows.

"1. To introduce ecology and give an overview of the basic concepts necessary for understanding ecological issues."
2. To indicate that an understanding of ecological processes is essential for assessing human impacts on the natural world.
3. To devise a popular exhibition that educates and enthuses visitors, and motivates them to consider the importance of ecology.
4. To develop an exhibition in which the key messages are accessible to the visitor in a single visit.

(The Natural History Museum 1991a:1)

Target audiences were the general public with no specialist knowledge of biology, and a minimum reading level of 15 years.

OBJECTIVES OF THIS EVALUATION

"1. To assess the success of developmental objectives (see the exhibition objectives).
2. To gauge people's reactions to the Ecology Exhibition via affective and cognitive questioning." (Ibid)

a) METHODOLOGY

The methodology is briefly summarised as follows:

1. The date: one week (school term) in July 1991.
2. 100 face to face interviews selected randomly when visitors were about to leave with no demographic requirement except people under 15 years old and non-English speakers were not included.
3. Main materials: questionnaire with prompt cards took from 10 to 15 minutes to complete for each person including closed-ended and open-ended questions.

b) OVERVIEW OF RESULTS
DEMOGRAPHIC
- 59% of respondents had some forms of biological qualification.
- There was little correlation amongst ages, sexes and biological backgrounds of visitors in terms of their responses. What seemed to be more influential was each visitor's background interests.

LENGTH OF STAY
- 63% of respondents spent less than 30 minutes. However, as many as 37% stayed for more than 30 minutes (Note: the method used was not direct observation, but questionnaire). Figure 4.13 shows the results with bar chart below.

LENGTH OF STAY IN THE ECOLOGY EXHIBITION, THE NHM
Fig 4.13
(A SUMMATIVE EVALUATION)

<table>
<thead>
<tr>
<th>No. of visitors (%)</th>
<th>&lt;15</th>
<th>15-30</th>
<th>30-60</th>
<th>60+</th>
</tr>
</thead>
<tbody>
<tr>
<td>(minutes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Based upon data from "Ecology an Evaluation", The Natural History Museum 1991:p5)
AFFECTIVE OUTCOMES

- All types of exhibits (in the Ecology Exhibition) were well received, being ranked at 4.31 on a scale of 1 to 5.
- 83% of respondents felt that the balance of exhibits did not need to be improved.
- The most popular exhibits were "video and computer visuals" (55%). On the other hand, animal specimens (15%), and some specific exhibits (rainforest/savannah/model people with video cameras) (15%) were least enjoyed.

Visitors felt that animal specimens were contrary to the overall message of the ecology exhibition. These results are shown in Figure 4.14 and 4.15 as follows.

Most Enjoyed Exhibits in the Ecology Exhibition, the NHM

(A Summative Evaluation)

Frequency of response

<table>
<thead>
<tr>
<th>Aspect of the exhibition</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Video and computer visuals</td>
<td>100</td>
</tr>
<tr>
<td>B: Simple explanations</td>
<td>80</td>
</tr>
<tr>
<td>C: Thought it was all &quot;nice&quot;</td>
<td>60</td>
</tr>
<tr>
<td>D: The rainforest environment</td>
<td>40</td>
</tr>
<tr>
<td>E: Interactive exhibits</td>
<td>20</td>
</tr>
<tr>
<td>F: Telephones</td>
<td>10</td>
</tr>
<tr>
<td>G: Text/quotations</td>
<td>10</td>
</tr>
<tr>
<td>H: Leaf factory (photosynthesis)</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig 4.14

(Based upon data from "Ecology an Evaluation", The Natural History Museum 1991:p14)
LEAST ENJOYED EXHIBITS IN THE ECOLOGY EXHIBITION, THE NHM

(A SUMMATIVE EVALUATION)

Fig 4.15

Frequency of response

(\%)

100

80

60

40

20

0

100

80

60

40

20

0

A: Nothing; enjoyed everything
B: Animal specimens
C: Specific exhibits
(Rainforest/savannah/model people with video cameras)
D: Already knew information/
too simple
E: Crowding
F: Explanations too long
G: Video and computer displays
H: Overall approach

Aspect of the exhibition

(Based upon data from "Ecology an Evaluation",
The Natural History Museum 1991:p15)

COGNITIVE OUTCOMES

- 49% of respondents felt that the "message" of man and the environment was depressing. 31% thought it was hopeful, and 20% realistic.
- Nearly 50% of respondents did not agree that "When untouched by man, nature is in perfect balance and unchanging."
- 52% of respondents felt that the key message of the Ecology Exhibition is "our responsibility to preserve the environment," and "human destruction/interference with the environment."* 18.5% of respondents felt the key message was that "the inter-connection/inter-dependence of communities" which is probably the key message ( * Note: the evaluators felt that the majority of respondents answered this question might have been influenced by the last exhibit "human impacts on the environment", because of strong retention of the information). These results are shown in figure 4.16 below.

MESSAGES COMMUNICATED IN THE ECOLOGY EXHIBITION
Fig 4.16
ANSWERED BY VISITORS, THE NHM
(A SUMMATIVE EVALUATION)

Frequency of response (%)

100
80
60
40
20
0

A: Our responsibility to "preserve" the environment
B: Human destruction/interference with the environment
C: The inter-connection/inter-dependence of communities
D: An introduction to ecology
E: How the earth functions/is balanced
F: No message is communicated

Based upon data from "Ecology an Evaluation",
The Natural History Museum 1991:p16)
The Exhibition was considered very relevant to environmental issues involving man, with an average score of 4.05 on a scale of 1 to 5. However, some respondents wanted more realistic examples. These results are shown in Figure 4.17 as follows.

**Relevance to Environmental Problems in the Ecology Exhibition Answered by Visitors, The NHM**

*Fig 4.17*

*(A summative evaluation)*

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Frequency of response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Low)</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>5 (High)</td>
<td>50</td>
</tr>
</tbody>
</table>

(Based upon data from "Ecology an Evaluation",
The Natural History Museum 1991:p12)
OTHER INFORMATION

- 55% of respondents felt that more detailed information was needed, and 30% wanted more about the destructive influence of man and more practical ideas to prevent environmental damages.
- 20% of respondents felt that the man and environment section needed to be improved with more optimistic and more practical information.
- In addition to these, some opinions of respondents as selected by this author, are as follows.

1. Add translated text for some languages.
2. Prepare take away leaflets.
3. Inform about environmental groups/organisations.
4. Need staff to answer visitors' questions about ecology.
5. Need air-conditioning.
6. Be ready to run an exit lift all the time for wheelchairs and pushchairs (because of often out of order).
7. Prepare an itinerant ecology exhibition.

CONCLUSION

The evaluators concluded that "the Ecology Exhibition seemed to be successful, appealing to a broad cross-section of people" and "the exhibition objectives seemed to have achieved quite proficiently" (The Natural History Museum 1991a: 20).

c) DISCUSSION (by this author)

In spite of this small scale investigation, some valuable information has been obtained from visitors. However this author wishes to make the following comments:
1. Length of stay in the Exhibition was investigated via questionnaire, not via direct observation. The results might be different to reality (However generally, this investigation is conducted with questionnaire, because observation is extremely time-consuming).

2. 49% of respondents felt that the "message" of the man and the environment was depressing. However such people might be of two types that:
   a) depressed people may not want to help conserve the environment, because they might feel it is too late to recover, on the other hand,
   b) depressed people may become conscious of the help needed to conserve the environment because life instinct makes them wish a long life.

Hence the strong message of man's negative impacts on the environment might not always makes visitors weak-kneed to help conserve the environment rather sometimes encourage them to do so. However optimistic information in terms of the ways of conservation is also needed to enhance visitors' decision-making to help conserve the environment.
METHODOLOGY FOR THE CASE STUDY OF THE ECOLOGY EXHIBITION IN THE NHM (NATURAL HISTORY MUSEUM, LONDON)

(A) INTRODUCTION

Of course an element of this research started in chapter 1. It investigated background knowledge on the topic "Environmental Education Through Museums" such as museums and their education; environmental education in general and through museums; and visitor studies for museums. Then this chapter has discussed research methodology in general and specifically for exhibitions, and some secondary evaluation data on the NHM (Natural History Museum, London) have been analysed, in general and the Ecology Exhibition in particular.

Based on all these considerations, this section will outline the justification for a detailed case study of the Ecology Exhibition in the NHM. Actually this research is a form of "action research", because action research is committed to action, to the solution of problems and the improvement of practice, in a direct way (see p140), using a variety of methods such as questionnaires, interviews and case studies (Cohen & Manion, 1994:192). However this research is regarded as a detailed case study, because it consists of 2 major elements, that is:

1. **Study over a period of time** (this is the nature of many case studies, see p140). It examines the development of the Exhibition over a period of time, from the blueprint stage to the analysis of secondary data on the Exhibition.

2. **Observation** (in any case study, observation is a major method, see p141). For example, "attracting power", "holding power", "visitors' length of stay", and "general observation" will be conducted (see p204).
Although, a case study approach is adapted, to reinforce the results from the observation, a range of qualitative and quantitative techniques of data collection are used where appropriate. These include questionnaires, interviews and quizzes. The overall justification for such an in depth analysis is that the insights gained are the most appropriate for achieving the research objectives outlined. Then, those insights should have important messages for designers of future similar exhibitions, and therefore such a comprehensive and detailed case study is felt to be invaluable.

AIM OF THIS RESEARCH

As mentioned in the "Introduction" (see p2), the aim of this research need to be recalled. It is as follows:

• How to educate about environmental issues through museums, especially through ecology exhibitions, in order to save the earth.

The ultimate aim of this research is to create effective environmental education for the public through museums, especially to set up educationally effective "ecology exhibitions" describing the "human impacts on the environment", in order to save our indispensable planet.

In the first instance two vital questions need considering. They are as follows.

1. Why are museums chosen to educate the general public in this field of environmental education?

It is suggested that, the best method of environmental education is out of school experiences (see through chapter 2) for both school children and adults. Museums, similar exhibits and environmental study centres (see pp74,
75) can provide suitable educational experiences for all kinds of visitors to foster their basic knowledge on this subject which have been obtained in schools and from a variety of other information sources. At the same time, these institutions help visitors to reduce their prejudices against environmental science and ecology as much as possible using the latest educational technology considering cognitive psychology as well as affective approaches and outcomes. To achieve these purposes, museums arguably could be considered to be the best places for all kinds of audiences, if museums can become aware of this role and research into this discipline as well as visitor studies to help set up the most effective educational ecology exhibits.

In addition to this, environmental science and ecology can be taught not only in such specific exhibitions but also many kinds of museums can do the same. Examples are art and history museums (see pp77,79).

2) Why are exhibitions chosen to environmentally educate the public within the many educational services offered by museums?

According to previous studies, for most people, the image of museums comes from the exhibitions themselves (see p13). This evidence suggests that exhibitions are the face of museums and also these are the most popular part of museum education services. Museum visitors wandering around an exhibition might be a form of enjoyable recreation without any overt purpose of study. Indeed it can sometimes be an escape from heavy rain outside. Consequently, educational exhibition design must be a top priority within education services, if museums want some issues to appeal to the public such as, in this case, environmental issues.
In addition to this, this author emphasizes that the aims and information by exhibitions must not be modified by bias in whatever form.

(B) OBJECTIVES OF THIS CASE STUDY AND RESEARCH QUESTIONS

The main part of this case study will be conducted in the Ecology Exhibition in the NHM. The reasons for choosing this Exhibition are as follows.

REASONS FOR CHOOSING THE ECOLoGY EXHIBITION IN THE NHM AS THE CASE STUDY

1. The Ecology Exhibition directly relates to environmental education.
2. This Exhibition is one of the biggest ecology and environmental exhibitions in the world and used many modern educational technology, some of which were provided, based on the results of front-end evaluations (see pp175-183).
3. The NHM is located in central London, hence the Exhibition is one of the most influential exhibitions for British as well as for tourists from all over the world.

However, this case study is neither simply a summative evaluation of the Ecology Exhibition nor only a part of visitor studies. This research does not intend finding faults with this Exhibition, rather to find some useful results for future good practice. Hence this case study distances itself from so-called summative evaluation even though such evaluation will be partly included. The study is a wide-ranging investigation, and can be divided into three main sections: Physical Analysis; Psychological Analysis; and Sociological Analysis. All these terms was interpreted and defined by this author. The definition of these terms are as follows.

DEFINITION OF THREE ANALYSES
1. **Physical Analysis is:**

   the analysis of the background and physical conditions of an exhibition. This study is wide-ranging from the stage of planning including blueprint to the stage of opening including its physical conditions, and also publicity and other education services for the exhibition. However this study basically does not include the investigation of general visitors' behaviour in the exhibition, and their attitudes towards the exhibition.

2. **Psychological Analysis is:**

   the analysis of visitors' behaviour in an exhibition, and their attitudes towards the exhibition. This research is similar to summative evaluation using some standard research methodology such as observation, questionnaires and interviews.

3. **Sociological Analysis is:**

   the analysis of visitors' sociological influences from an exhibition such as changing their attitudes after their visits, and also the general public's opinions about the subject matter as well as similar exhibitions using interviews both in the gallery and the street, and mailed questionnaires.

Through these analyses, the objectives and research questions of this study are as follows.

**OBJECTIVES OF THE CASE STUDY**

- To examine the background and physical conditions of the Exhibition, and assess them from the viewpoint of museum studies.
- To gauge visitors' behaviour in the Exhibition and discover their opinions about the Exhibition, and assess the Exhibition objectives (see p183).
- To determine the sociological influences on visitors from the Exhibition.
after their visits, and assess the degree of the impact of the Exhibition. To investigate the general public’s (including visitors) level of understanding of ecology, and their opinions on environmental issues as well as ecology exhibitions, and suggest future practice for environmental education through museums based on this in depth case study.

RESEARCH QUESTIONS

1. Physical Analysis:
   - What was the strategy for the Exhibition (e.g. blueprint)?
   - How has the Exhibition been publicized?
   - What is the physical and conceptual orientation?
   - What is the route and sequence through the gallery?
   - How has each section been organized?
   - How is each exhibit laid out?
   - How is interpretation made for each exhibit such as label placement, physical appearance of the label, and contents of the labels?
   - What are the audio-visual effects including computers?
   - What are the other physical conditions of the gallery such as climate and facilities for handicapped people and safety?

2. Psychological Analysis:
   - What behaviour do visitors display in the gallery such as average length of stay; attracting power; holding power; and other behaviour?
   - What are the visitors’ opinions about the Exhibition?

3. Sociological Analysis:
   - What are visitors’ motives for visiting the Ecology Exhibition.
   - What is the visitors’ educational backgrounds?
• What is the general public's level of understanding of ecology?
• What are the general public's opinions towards environmental issues?
• What do they think about ecology exhibitions?
• What do the visitors remember after a certain time has passed since leaving the Exhibition?
• How has the Exhibition had an influence upon visitors' life styles?

(C) METHODOLOGY

To begin with, figure 4.18 (see p199) describes the sequence of this thesis and methodology of the case study briefly. Then, each three elements of analysis: physical analysis; psychological analysis; and sociological analysis will be described in detail.
ENVIRONMENTAL EDUCATION THROUGH MUSEUMS
A CASE STUDY OF THE ECOLOGY EXHIBITION IN THE NHM

CHAPTER 1
MUSEUM EDUCATION IN GENERAL
- DEFINITIONS OF MUSEUMS
- ROLE OF MUSEUM EDUCATION
- HISTORY OF MUSEUMS & MUSEUM EDUCATION
- EXAMPLES OF THE ROLE OF MUSEUM EDUCATION & THE PROBLEMS RAISED

CHAPTER 2
ENVIRONMENTAL EDUCATION
- ENVIRONMENTAL ISSUES
- ENVIRONMENTAL EDUCATION IN GENERAL
- ENVIRONMENTAL EDUCATION THROUGH MUSEUMS

CHAPTER 3
VISITOR STUDIES FOR MUSEUM EDUCATION
- VISITOR STUDIES IN GENERAL
- VISITOR STUDIES FROM THE PSYCHOLOGICAL & SOCIOLOGICAL POINTS OF VIEW
- NEW TRENDS IN VISITOR STUDIES

OUTLINE OF THE RESEARCH METHODOLOGY IN GENERAL
- EVALUATION METHODOLOGY FOR EXHIBITION
- THE NHM: SECONDARY DATA ANALYSIS IN GENERAL & ECOLOGY EXHIBITION
- ORIGINAL METHODOLOGY OF A CASE STUDY

CHAPTER 4
RESEARCH FOCUS & APPROACH

CASE STUDY
- CHAPTER 5 PHYSICAL ANALYSIS
- CHAPTER 6 PSYCHOLOGICAL ANALYSIS
- CHAPTER 7 SOCIOLOGICAL ANALYSIS

(METHODS)
- BACKGROUND EXHIBITION DESIGN
- OTHER EDUCATIONAL MATERIALS
- LITERATURE RESEARCH
- STAFF INTERVIEW
- PHYSICAL MEASUREMENT
- OBSERVATION QUESTIONNAIRE
- GALLERY INTERVIEW
- VISITORS' BEHAVIOUR & ATTITUDE
- GENERAL PUBLIC'S ATTITUDE
- GALLERY INTERVIEW
- STREET INTERVIEW
- ECOLOGY QUIZ
- MAILED QUESTIONNAIRE

CHAPTER 8
SUMMARY & FUTURE POLICY IMPLICATIONS

OBSERVATION
- (CAMERA)
- AVERAGE LENGTH OF STAY
- ATTRACTING POWER
- HOLDING POWER
- GENERAL OBSERVATION

INTERVIEW
- (TAPE RECORDER 5 MINUTES)
- SEMI-STRUCTURED OPEN-ENDED
- QUESTIONNAIRE
- QUESTIONNAIRE SHEET
- CATEGORY RATING
- DEMOGRAPHICS

No. OF SAMPLES: APPROXIMATELY 1000

- 199 -
a) METHOD OF PHYSICAL ANALYSIS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>MENU</th>
<th>RESOURCES</th>
<th>ANALYSIS</th>
</tr>
</thead>
</table>
| BACKGROUND    | - Historical background  
                - The funding  
                - Strategy for exhibit  
                    (e.g. blueprint & educational materials)  
                - Publicity | - literature from the NHM |                                                    |
| ORGANISATION  | - Advance/Topographical orientation  
                - Conceptual orientation | - Interviews with staff  
                - Inspection  
                - Materials from the NHM | From the viewpoint of museum studies |
| OF THE EXHIBIT| - Label placement  
                - Physical measures  
                - Content | - Exhibition design & statistics books |                                                    |
| INTERPRETATION| - Illumination  
                - Sound effect  
                - Video  
                - Touch screen  
                - Computer  
                - Multi-media  
                - Quadroscope | |                                                    |
| PHYSICAL CONDITION | - LUX, RH, TEMP, & Disturbance sound - Facility for handicapped people - Safety |

ADDITIONAL CHECK ITEMS

Some idea used below, in particular, numerical value come from *Good Show* by Wittebord L.P. 1981; *AIM (Association of Independent Museums) Guidelines No.10: An Introduction to Slide/Tape Audio Visuals* by Dean I. 1986 (also see pp106-113).

1. PUBLICITY

Press, banners, billboards, posters, stickers, handbills, radio & TV

2. TOPOGRAPHICAL ORIENTATION

Hand-held map & wall map; Arrow/ Landmark; Circulation area & distance; Chunks (divisions of the exhibition); Layout (objects/replicas/dioramas/ object satiation)

3. INTERPRETATION

*Label Placement:*

- Hight & distance (1.58m - 5'3” from floor, if installed on the wall/field vision: 40°

*Label density

*Distance from other displays

*Physical Measurement:*

—201—
• Number of words (Max: 22 words a sentence/75 words a label)
• Size of letters (Min: 24Pt [about 6mm in height] for objects labels to 75Pt [about 15mm in height] for general labels)

Content:
• Reading level (15 year olds; 3-level interpretation)
• Question/challenge/comparison/correct misconception/use other senses
• Avoid: overload/superfluous labels/subordinate clauses/capital letter (except the titles)/passive sentence & Why sentence (if possible)

4. A-V EFFECT

Illumination:
• Prevention of lighting falling on screen

Touch screen & computer:
• To be able to see the display operated by other visitors
• To be a logical part of the exhibit

Films or video shows:
• Length of the show (less than 12 minutes)
• Waiting time (less than 10 minutes)
• Room size (6x8m for 30 people/8x10m for 45 people; each half of the size is for school children)
• Ideal height of the Bottom of the screen
  (1.2m above floor level)
• Ideal height of the top of the screen
  (around 3m in case of using chairs for audiences)
• Maximum distance from the screen (8 x screen height)
• Content
• Languages used

5. PHYSICAL CONDITIONS
LUX, RH \(^{11}\), TEMPERATURE:

- LUX: 50 max for natural history specimens, others are unlimited in this Exhibition. RH: 50\% ± 5\% / TEMP: 20\degree C ± 5\degree (65\degree F ± 5\degree)

Facilities for Handicapped people:
- Braille description
- Cut Kurb for wheel chairs
- Script of A-V presentation
- Cassette tour/hands on objects
- Coat ramp with nonslip surface

Safety:
- Avoid: loose carpets/trailing cords/ sharp angles
- Anti-skid mats
- Emergency doors/ fire escapes

<INSTRUMENTS>
Note pad/ pen/ ruler/ tape measure
Hygrometre/ thermometre/ LUX indicator
Camera (for print)/ tape recorder

(1) The ratio (expressed as \%) between the water vapour content of a given amount of air and the moisture it could contain if the air had been saturated at the same temperature and pressure (James G. et al, 1990, p368).
### b) Method of Psychological Analysis

<table>
<thead>
<tr>
<th>Section</th>
<th>Menu</th>
<th>Resources</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>- Visitors' Length of Stay (VLS)</td>
<td>- Literature from the NHM</td>
<td>Comparisons of expected</td>
</tr>
<tr>
<td></td>
<td>- Attracting Power (AP)</td>
<td>- Papers of the visitor studies</td>
<td>data and actual outcomes</td>
</tr>
<tr>
<td></td>
<td>- Rating Holding Power (HPr)</td>
<td>- Statistics/Psychology books</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- General Observation (GO)</td>
<td>- Original forms for the case study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Quantitative &amp; qualitative analysis</td>
<td>- such as observation form; question-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- naire form; and interview form</td>
<td></td>
</tr>
<tr>
<td>Questionnaire</td>
<td>- Affective effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Cognitive effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Quantitative analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gallery Interview</td>
<td>- Particularly interesting parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Basic message</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Need to be improved or not</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Quantitative &amp; qualitative analysis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. OBSERVATION

1) ITEMS OF MEASUREMENT (except school groups)

Visitors' Length of Stay (VLS):
Average of visitors' length of stay (50 visitors for pilot study; 100 for main study).

Attracting Power (AP):
How many percent of visitors stop at the selected section (20 solitary visitors and 20 groups for pilot study; 30 solitary visitors and 30 groups for main study).

Rating Holding Power (HPr) (by J.H. Iguchi):
How long does a visitor stop at the selected section, and it is divided by VLS (10 solitary visitors and 10 groups for pilot study; 15 solitary visitors and 15 groups for main study).

General Observation (GO):
To observe visitors' behaviour unobtrusively as much as possible at the all sections. Caution! "Reactivity" (e.g. people view exhibits longer if they know they are being observed in a study – see Centre for Social Design, 1988:9).

2) SELECTED SECTIONS (see pp252-265)  [M]: Main observation  [P]: Pilot
A) The rainforest
B) Chasm - Earth science
C) Chasm - Ecosystems  [P] [M]
D) The water circle
E) Oceans
F) Land
G) Energy and sunlight
H) The leaf factory  [P] [M]
I) Feeding - Lion  
J) The chain, The web & The pyramid  
K) Nutrient cycles (1) - A rabbit's life  
L) Nutrient cycles (2) - Computer  
M) Population balance  
N) Environmental changes  
O) Population together - The barn community  
P) How ecosystems grow  
Q) Human impacts (1) - Bulldozer  
R) Human impacts (2) - Films  
S) Human impacts (3) - Greenman  

<INSTRUMENTS>  
Note pad & pen  
Counter (for counting visitors)/ Stop watch/ Tape recorder  

2. QUESTIONNAIRE & INTERVIEW  

1) SAMPLING (randomly selected - see chapter 6)  

<table>
<thead>
<tr>
<th>DEMOGRAPHIC PATTERN</th>
<th>PILOT</th>
<th>MAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-20</td>
<td>20+</td>
</tr>
<tr>
<td>SOLITARY VISITORS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MALE</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FEMALE</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
2) AREA: Close to the Ecology Exhibition using some desks and chairs.

3) MANNERS:
   - Ask in a friendly manner if they would fill in.
     "Hi! Would you mind answering some questions about ecology that should only take a few minutes?"
   If the visitor accepts, continue telling that:
     "My name is Jack Iguchi, a museum curator and a PhD researcher on ecology. The Natural History Museum would like to improve this exhibition by asking their visitors. Please fill in this questionnaire."
   - After filling, ask again that:
     "Would it be possible to answer some brief questions?"
   - After finishing, say that:
     "Thank you very much indeed for your time. Have a nice day."

<INSTRUMENTS>
Note pad/ pens & paper holders (for interviewer and interviewee)
Questionnaire form/ Interview form/ Tape recorder
Note: "Gallery Questionnaire" and "Gallery Interview Form" are inserted in Appendices 15 and 17.
### c) Method of Sociological Analysis

<table>
<thead>
<tr>
<th>Section</th>
<th>Menu</th>
<th>Resources</th>
<th>Evaluation</th>
</tr>
</thead>
</table>
| Motive & Demographic Studies | - Motives for visiting
- Visitors' educational backgrounds | - The NIM data base for visitors
- Ecology/
Psychology/Statistics books | Comparisons of expected data and actual outcomes |
| Ecology Quiz           | - Results of the quiz
- Quantitative analysis | - Original forms such as
1) Ecology quiz
2) Gallery/Street Interview form | |
| Gallery & Street Interview | - Results of the interview
- Quantitative & Qualitative analysis | - Qootionnaire - Expected data & form | |
| Mailed Questionnaire   | - Results of the questionnaire
- Quantitative & Qualitative analysis | 3) Mailed questionnaire | |
1. ECOLOGY QUIZ

Ask randomly selected 100 visitors (see chapter 7) if they challenge the ecology quiz to gain a certificate prepared by this author as a token.

Say "Hello! I am a museum curator from University of London. Would you like to answer 4 questions on ecology? If you get 1 of the questions right, you will get a certificate. It will only take a few minutes."

2. GALLERY INTERVIEW (see Method of Psychological Analysis pp206,207)

3. STREET INTERVIEW

1) Area : London
2) Sampling :

Randomly choose 100 pedestrians of balanced age and sex.

<table>
<thead>
<tr>
<th></th>
<th>Teens</th>
<th>Young adult</th>
<th>Middle age</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>F</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

4. VISITORS' EDUCATIONAL BACKGROUNDS ASKED

1) Up to 16 (e.g. secondary school)
2) Up to 18 (e.g. sixth form college)
3) First degree
4) Higher degree

5. MAILED QUESTIONNAIRE

Send "Questionnaires" to some schools, which have visited the Ecology Exhibition during the past year, with a letter of request and a covering letter by this author's supervisor.

<INSTRUMENTS>

Note pad/ pen/ Tapr Recorder
Ecology Quiz/ Ecology Studies Certificate/ Gallery & Street Interview Forms/
Mailed questionnaire (School Questionnaire)
Request letter/ Covering letter/ Letter of thanks (if answered)
Note: some instruments are in the Appendices 17,19-24.

This chapter has examined the focus of this research and its approach from a variety of angles. Firstly, an outline of the research methodology in general and evaluation methodology for exhibitions with some practical examples were discussed in short to reduce any description of statistics in the later chapters. Secondly, secondary data in the NHM were analysed in general and particularly about the Ecology Exhibition. Lastly, based on these previous studies, an original method for a case study of the Ecology Exhibition in the NHM has been created.
CHAPTER 5

PHYSICAL ANALYSIS OF THE ECOSYSTEM EXHIBITION IN THE NHM, LONDON

According to the research methodology as outlined in chapter 4 [4] (see pp192-210), this chapter discusses "physical analysis" which was defined by this author (see p196). This investigation is a wide-ranging study consisting of a literature survey, the measurement of some functions of the Exhibition, and a discussion of the results from the viewpoint of museum studies.

(A) HISTORICAL BACKGROUND

In chapter 1, the historical background of the NHM has been discussed (see pp36-37). Before setting up the Ecology Exhibition, a small scale ecology exhibition was established called "Introducing Ecology" (British Museum [Natural History], 1987: section 16). This exhibition mainly discussed two familiar British ecosystems - an oak woodland and a rocky seashore using dioramas explaining fundamental terminology such as "primary producers of energy" (green plants); "herbivores"; "carnivores"; "omnivores" (like human); "decomposers" (like fungi and bacteria), and "food chains and webs" were described. However "human impacts on the ecosystem", which is an important recent debate, was not emphasized. At least, in the catalogue for the public, this matter was not mentioned (see Ibid). Hence, this author concludes that this exhibition was a small scale study of ecology in general.

Then the museum planned to renew this exhibition because it was seen to be not so effective and should be relevant to current environmental issues. The Museum started audience research from the viewpoint of visitor studies in 1988 (The Susie Fisher Group, 1988: i-xiii, 1-29), (see pp175-183). In addition, this new Ecology Exhibition was founded with £1.0 m subsidy from BP (British
BP (British Petroleum) does not only donate money to organisations like the NHM to set up the Ecology Exhibition, but also researches into ecology and environmental science of its own accord. Generally speaking, oil companies are directly concerned about environmental pollution because they produce oil fuel and oil products most of which can cause environmental problems. However BP understands these problematic issues and the dilemma between the public's demand and the supply of energy and chemical products. The following are two questions to BP about their involvement in the Ecology Exhibition.

1. Why is BP researching into ecology or environmental science of their own accord?

"The nature of BP's business means that we are very conscious of our responsibility in protecting the environment. We must all seek to maintain the biological diversity of our planet and to avoid leaving behind us an unfriendly and harsh environments for succeeding generations. That is why we in BP are sponsoring research work on many of the world's important ecosystems - wetland, heathlands, tundra and tropical rain forest" (Horton, 1991).

2. Why does BP want to pay for the setting up of an ecology exhibition at, particularly, the "NHM"?

The NHM has a worldwide reputation as a centre of knowledge and in a unique position to educate and to give perspective to environmental problems. Through our sponsorship of the Ecology Exhibition, BP and the NHM will
reflect on the importance of the public debate on these global issues (Ibid).

In addition, in the main text book on this Exhibition for both the museum and visitors: "Global Ecology" (Tudge, 1991), the author emphasizes the importance of understanding ecology by saying that "Policies that may enable us to care for it must be made by governments. But the understanding that will enable us to do the right things, if we have the will to do them – that depends on the science of ecology. That is why it is important. That is why The Natural History Museum has mounted its major Ecology Exhibition" (Tudge, 1991:ix).

This new exhibition still educates the public to ecology in general, but human impacts on the environment are more directly emphasized than the former exhibition with adoption of new psychological techniques from the world of visitor studies.
Recently, a new museology in terms of architectural and exhibition design is widely debated by architects and exhibition designers. Some typical new models of these designs have been published for designers as well as the general public. These examples include "New Museology" (Papadakis, 1991) describing the Third Annual Academy Forum on New Museology at the Royal Academy of Arts, London, arguing for some new art galleries; "New Museums" (Krase & Klotz, 1986) describing some new architectural designs in Germany with their blueprints; "Designing Exhibitions" (Velarde, 1988) describing some new exhibitions including the NHM, geological exhibition. However some new museums and exhibitions have been designed from mainly an architectural point of view without regard to the educational point of view (Iguchi H. 1992:20). These are serious and problematic issues.

The new Ecology Gallery has been also designed with new architectural ideas and it is one of the latest designs in the museum world, since it consists of two 5.4m high continuous opti white glass walls which house exhibits (Building today, 1990). Will this Gallery be acceptable to visitors? Can this design coexist with successful educational impacts of the subject matter? Why has this design been used - that is what is its concept? Thanks to its innovative design, some countries' architectural magazines have discussed the Ecology Gallery.

ITALY
An Italian international magazine of architecture, design and visual
communication, "I'ARCA", November 1992 (I'ARCA, 1992) introduced in detail the Ecology Exhibition from an architectural point of view. This article describes the outline of the blueprint and concept of this architecture both objectively and subjectively. Some of the points it raises are as follows:

• The Ecology Exhibition is integrated with the Victorian architecture designed by Alfred Waterhouse, maintaining the original spirit of the building, and it is to run till 2001 (Ibid:47).

• The two complementary identities of the architecture and the exhibition are observed. The former is the NHM itself, a Neo-romanic building constructed in the late 19th century, and the latter is the Exhibition designed by Ian Ritchie which "looks as if it was taken straight out of a novel by Michael Crichton, author of Jurassic Park" (Ibid:42).

• Using many glass walls and bridges, this architecture suggests metaphorically to visitors the problems raised by the current fragility of the relationship between humans and nature. The Exhibition route is made up of walkways in filagree metal intersecting with transparent and translucent Optiwhite glass walls" (Ibid:44).

• The quadrosphere (or quadroscope) provides information on water and the oceans thanks to hundreds of monitors installed on its spherical surface showing extraordinarily fragmented and multiplied screens by the thousands of reflections.

SPAIN

In the Spanish architectural magazine "Diseno interior", Fermin Vazquez (Vazquez 1993) introduced the Ecology Exhibition. Some contents are the same as the former ones. Some main points are summarized below:
The earth science section in chasm is described in detail: "The Ecology Gallery is delimited by two glass walls that run lengthwise along its space; one is curved and illuminated by cold-tone lighting which symbolizes water, while the other has a warmer tone to its lighting, suggesting energy and fire" (Ibid:63). "The trunks of the columns of the building by Waterhouse are contained within the glass walls, and at certain points they can be seen through the panes of transparent glass; the windows opened in the walls which allow the exhibits to be seen are arranged at two heights: one for adults and the other for children" (Ibid:67).

Glass walls and bridges, which are the main viewpoint of this architecture, are also described that "the side aisles, where the topic units of the Exhibition are located, are divided into two floors by the creation of a mezzanine, which spans the space between the two glass walls by means of four organically structured and sinuous gangways"(Ibid:66).

The metaphorical design of glass structure is also interpreted that "glass in this work symbolizes the ecological fragility of the planet, and this idea of vulnerability is emphasized by keeping their fastening systems hidden" (Ibid:69).

JAPAN

In the Japanese design magazine "FP", John Welsh (1992:88,89) introduced the Ecology Exhibition. This article emphasizes the impression given by the Exhibition and compares the Gallery with the Dinosaur Gallery, both of which adopted the new trend of exhibition design. He suggests that these exhibitions are rich in and full of creativity, hence conservatives might be embarrassed. Also when passing four glass gangways, it gave him a feeling of mystery.

On the other hand, the Dinosaur Gallery was designed practically using a
simple gangway, 84 metres long in the air. This enables visitors to view the whole exhibition and large dinosaurs from various angles. Also the gangway shows architectural beauty both as a dynamic construct and the fine technology such as the jointed parts.

In addition, the Gallery was designed using the Cable 4D series computer aided design system (CAD) which "allowed the architects to create 30 options in two weeks instead of the two or three options they could have produced using a drawing board over the same period of time" (Building, 1990).

DISCUSSION
All these articles tend to be positive in terms of the architectural design. In particular the Italian article describes it using a variety of emotional terms. The Spanish article gives readers detailed information objectively. However, in the Japanese article, the phrase "conservatives might be embarrassed" perhaps implies a critical view of the latest architectural design of exhibitions. The main purposes of this design are discussed in the following terms:

• the purpose of integration of the Ecology Gallery and the Victorian architectural design is to maintain the original spirit of the building; and
• glass symbolizes the ecological fragility of the planet.

In addition, some arguments in terms of this architectural design in the UK will be investigated in section (C) PUBLICITY AND CRITICISM OF ARCHITECTURAL DESIGN (see p236). Some three dimensional figures of the blueprint are shown in figures 5.1-5.3 below.

All in all, how general visitors feel this gallery is one of the study in this case study in chapter 6.
ECOSYSTEMS SECTION IN THE ECOLOGY EXHIBITION, THE NHM

From "L'Immaginario Tecnologico, The Ecology Gallery, I'ARCA, November 1992"
GLASS GANGWAYS & WALLS IN THE ECOLOGY EXHIBITION, THE NHM

Fig 5.2

From "L'immaginario Tecnologico. The Ecology Gallery I'ARCA. November 1992"
Fig 5.3

Perspectives that show the respectful installation of the exhibition

Transversal section

The Gallery floor plan

From "EL PABELLON DE ECOLOGIA
Diseno interior,
October 1993:p64

-221-
Around the opening date of 8th March 1991, some introductory and educational resources were published for all visitors including school groups. In general, educational materials enhance the affective and cognitive effect on visitors, and at the same time, they are essential for school visits to achieve full learning benefit. The materials for the Ecology Exhibition include introductory information; The Museum's writing resources for learning; guidance of exhibitions in the NHM relating to the Exhibition; some additional information such as external writing resources on ecology for school children, and about organisations concerned with ecology. In addition, some opening events were prepared and publicized. All the above will be summarized and discussed in due order below.

a) INTRODUCTORY RESOURCES

The majority of introductory resources are for school visits. For general visitors, a catalogue which introduces the whole museum is available from book shops in the NHM, and also some information flyers are available when visitors attend events relating to the Exhibition. The contents of these materials are summarized as follows.

1. The New Ecology Exhibition at the Natural History Museum (The Natural History Museum, 1991b)

This is a leaflet which introduces the objectives of the exhibition and its content in brief. The objectives as stated in the leaflet are as follows.

OBJECTIVES (in brief):
• To appeal to non-specialist visitors who wish to know more about the
scientific background to environmental matters.

- To introduce ecology and give an overview of basic concepts.
- To show that we need to understand ecological processes in order to regulate Man's impact on the natural world.

(Note: these are shown for the general public. The objectives showed for museums have been mentioned before - see pp183,184).

**EXHIBITION CONTENT:**

It is summarized in this leaflet in due order such as an overview of the exhibition; earth science section in chasm - atmosphere, hydrosphere, lithosphere, biosphere and emphasizing that the "Ecology Exhibition is introduced as the study of how the inorganic and organic elements piece together" (Ibid); water cycle using a quadroscope (large video sphere) and the sun's role as the prime source of energy for the ecosystems such as photosynthesis; food chains and webs, and recycling raw materials; population change and balance; Man's impacts on ecosystems emphasizing that "The huge power of modern technology can be a devastating force if not used wisely, so the answer has to lie in the sensitive use of technology to provide our requirements within the limits that the environment can sustain" (Ibid).

**CONCEPT OF ARCHITECTURAL DESIGN:**

The architect of the Ecology Exhibition, Ian Ritchie, intended to enhance the Exhibition's theme of technology co-existing with nature, and "keep a clear view of the proportions of the gallery with a vista along its entire length but also provide a series of self-contained intimate spaces to house the displays" (Ibid). Furthermore, Colin Tudge's book "Ecology" (1991) which was written to accompany the Exhibition is introduced.

2. SPRING 1991 - THE NEW ECOLOGY GALLERY (The Natural History Museum, 1991c)
This is a general information flyer in colour including an introduction to the Ecology Exhibition before it opened. This information uses some emotive language in order to attract potential visitors. The content is the description of each chunk of the Ecology Exhibition in due order such as a rainforest; a chasm - to study earth science; African plain and wildlife films suggesting that "ecology is the study of the whole picture, looking at how all the pieces- landscape and wildlife, living and non-living elements fit together" (Ibid); water cycle using a quadroscope (large video sphere); oceans and land; role of sun energy including photosynthesis; food chains and webs, and recycled carbon; life and death in the balance; the barn community (one community in the barn including animals and their food such as rats and crops; cats and rats; and a fox invaded and hens); recolonizing and reorganising after eruption of the volcanos; and human impacts on ecosystems emphasizing that the vast ecological world has been changing by people, however we now recognize that "our future is dependent on the diversity of species and genetic resources which are the source of much of our food, medicine and material needs as well as the very oxygen we breath" (Ibid). Finally, two questions are asked:

1. Can we study our own ecology, and discover a way that conserves the planet we live on?
2. Can we develop a relationship where sustainable development means co-operation with the rest of our planet's ecology so that natural diversity is preserved?

This is the challenge of the coming decades" (Ibid).


COLOUR PHOTOS:
In general, catalogues are made with emotive words and attractive photographs.
The Ecology catalogue shows some coloured pictures such as a quadroscope (water cycle - the biggest picture in the catalogue); a tiger feeding on a blackbuck (a sort of antelope); a leaf factory (photosynthesis); an African plain (the ecosystems section in the chasm); the sun centre (role of sun's energy); the rainforest; ocean; and the greenman (human impacts) describing "In our hands rests the future of natural diversity and the essential connections that allow life to flourish here on earth" (Ibid).

CONTENT:
The content is the introduction of the Exhibition such as the ingredients of life - air (atmosphere), earth (lithosphere and biosphere), water (hydrosphere) and the sun's energy; the Serengeti Plain (Africa) - to study ecology asking "What links acacia trees, impala and vultures? Ecology fits these different pieces of information together to built up a whole picture" (Ibid); a quadroscope (water cycle); oceans and land; role of sun's energy and recycling the energy through the creatures; human impacts on ecosystems saying that "Is there a way for us to live in the world without destroying it? Can we preserve earth's greatest treasure - its wealth of natural variety? It is the responsibility of each and every one of us to do so" (Ibid).

4. VISITOR RESOURCES - A TEACHER'S GUIDE: ECOLoGY (The Natural History Museum, ND10)

The Museum published some teacher's guides for specific exhibitions. This is a leaflet which includes "Introduction"; "Using the Exhibition" (how to use the Exhibition); "Exhibition content"; "Finding the Exhibition" and "Map of the Exhibition". The following are the main points of "Using the Exhibition" and "Exhibition content".
**Using the exhibition:**

- Relevant to KS (Key Stage) 3-4 (but pupils at all stages can enjoy learning).
- A one-way system.
- Should divide the class into some groups and stagger learning hours (to avoid congestion).
- Teachers must make a preliminary visit (if hoping to realize the full potential of the Exhibit).
- Accessible to wheelchair users (a lift at the end of Exhibition is available).

**Exhibition content:**

Ground floor chasm

* Rainforest experience

* The ingredients of life:
  
a series of globes introduces the earth's air, water and rocky crust with the sun's energy; African savannah grassland which emphasizes that "ecology is concerned with how the living and non-living elements of the earth link together (Ibid); video lasts 2 minutes.

* The water cycle

Rising ramp

* Ocean habitats

* Land habitats

Mezzanine level

* Energy for life:
  
radiation from sun; the spectrum; role of atmosphere; sun's energy for life; photosynthesis (a diorama - the leaf factory).
* Feeding and recycling:
herbivore, carnivore, omnivore, scavenger and decomposer; food chains and webs; pyramid in a forest ecosystem - a 4-minute audiovisual programme; nutrient cycles; journey of a carbon atom using a computer program - for a small group of pupils at one time.

* The shifting balance:
population balance and catastrophes; the barn community; natural disaster and creation of new habitat; human impacts.

* Human beings:
audiovisual presentation on the bulldozer blade showing the repercussions of human actions which last 1 to 2 minutes long; greenman (human beings) describing "Our challenge in the coming decades is to work our planet's ecology, and not against it (Ibid).

5. ECOLOGY - Using the Ecology gallery with children (The Natural History Museum, ND4)

This is a leaflet for teachers wishing to bring pupils and a subsidiary pamphlet of the former section 4 (Visitor Resources - A Teacher's Guide: Ecology). Some points on this are as follows:

- The visit will be a unique and evocative experience for pupils.
- Glass structure - complex and fragile - represents the essence of ecology; Spiny, vertebral bridges symbolize life.
- The Exhibition can be beneficial for all age groups.
- Visual and aural experiences are more emphasized than written texts.
- One-way system.
- Suitable sections for younger pupils are:
  - rainforest/earth science/ecosystems/water cycle (the whole ground floor);
  - Oceans (on the ramp); human impacts (the last section).
- Teachers' pre-visit is essential.
Visiting other exhibitions in the museum is recommended to extend a study of ecology.

CONCLUSION

Introductory resources are important for visitors to get to know the outline of the Exhibition. It is especially vital for teachers. Two leaflets "Spring 1991 - the new ecology gallery" (see p223), and "Visitor Resources - a teacher's guide: Ecology" (see p225) are well designed so that they can be kept as a longstanding educational resources. All this content and descriptions are slightly difficult for the general public, however it is not such a serious problem because normally the readers of this kind of information are well-educated. The catalogue is also well-designed and the most attractive of all these resources in this author's view. It is sold to the public hence it has to be easy to read.

b) RESOURCES FOR LEARNING

LEAFLETS FOR FURTHER LEARNING

Leaflets for further learning have been published to help visitors comprehend the meaning of ecology. The following examples give some indication of what sort of information the Museum gives to visitors. The following are this author's synopses of some of the leaflets.

1. THE WATER CYCLE (The Natural History Museum, ND5)

   Content
   - Ocean: describing ocean currents and movement of the tides.
   - Atmosphere: describing clouds, rain and snow.

2. BACKGROUND NOTES ON MARINE ENVIRONMENTS (The Natural History Museum, 1991d)
Content

- Temperature: It changes very slowly, so marine creatures have no temperature control organs.

- Salinity: The salinity of some marine animals is about the same as the salinity of the sea, and others can control the salinity of their bodies.

- Light: It penetrates the surface of the sea which supports many creatures' lives, but below the light zone is like deserts.

- Oxygen levels: More oxygen can dissolve in cold water than in warm water. Turbulence takes oxygen into the sea as well as being created by marine plants.

- Buoyancy: Water is a dense medium, so buoyancy result. Even blue whales can float on the sea.

In addition to these, the following exhibits in the NHM are recommended for the study of marine life such as:

- Ecology Exhibition (4 marine environments feeding - open sea, deep sea, rocky shore, coral reef)
- British Natural History Exhibition (rocky shore)
- Fishes, Amphibian and Reptiles Exhibition (coral reef, deep sea fishes, open sea fishes)
- Creepy-Crawlies Exhibition (marine invertebrates)
- Dinosaurs Exhibition (Ichyosaurs)
- Marine Invertebrates Exhibition (shells, crabs, starfishes)
- Mammals Exhibition (whales and dolphins)

3. ANIMAL ADAPTATIONS (The Natural History Museum, 1991e)

Content

Animals in water - They have streamlined bodies to swim easily in water which is a dense medium.
Fast fishes: They have sleek, bullet shaped body, muscular tail and dorsal fin which may fold down into a groove during swimming actively. Examples include mackerel and tuna.

Accelerating fishes: They wait for prey and then dart forward to catch them such as pike and shark. Sharks are cartilaginous fishes and swim all the time and rest on the sea bottom because of no gas bladder. They swim on a level rather than taking a nose-dive owing to fairy rigid sickle shaped front fins and asymmetrical tails.

Slow fishes: They generally live close to the coast using almost fins rather than muscular tails during swimming. Examples include puffer fish and most of the marine tropicals.

Back to the water - Otters, hippos, capybara, sealions, seals, dolphins and whales have evolved from land animals to marine animals and their shape is streamlined.

Otters: They have webbed feet and are truly amphibious animals.

Hippos and Capybara: Their nostrils, eyes and ears are in a line across the top part of the head so that they can use these sensors on the surface of the water efficiently. Their legs are relatively slight because water helps their movement.

Seals and Sealions: They spend most of their time in the water. They have flippers evolved from hands, and nostrils, eyes and ears are on the top of the head. They breed on the land.

Dolphins and Whales: Their front limbs have become flippers and they have lost hind limbs and fur. They give birth at sea.

Life on land - Burrowers, runners and climbers.

Burrowers: Their body shapes resemble swimmers' such as streamlined bodies and they have dense fur because of moving easily in the burrow. Their
sense of smell and hearing is good but sight is not. Examples include moles.

- **Runners:** They have long, slender legs and light feet such as plant-eaters like antelope and zebra, and predators like lion and cheetah.

**Plant-eaters:** They have square-shaped, elongated heads with eyes on either side and ears placed on the back of the head. Smells dissolve on the rhinarium (an organ in the nose) and are licked off to be tasted. They have long neck to scan around, bulky trunks to house their long guts to digest plant food, and long feet which look like legs. They can be divided into two such as two hooves per foot like cows and antelopes, and one hoof like horses.

**Predators:** Their shape of legs vary. Jaguars have thickish legs to ambush their prey, while cheetahs have long thin legs to run with maximum speed. Their spines can stretch out and have rounded heads with their eyes looking forwards in order to hunt prey efficiently.

- **Climbers:** They will be light bodied and have rounded faces with eyes at the front, and often have long tails to balance.

**Squirrels:** They have longer legs than their arms and sharp claws to grip branches in order to run up and down trees.

**Primates:** Most kinds of them have light bodies and they can grip the very tops of trees. Spider monkeys and gibbons have long fingers to swing under the branches. Lemurs have long back legs to launch them from one tree to the next. Chimps contact climb and have three limbs attached to the tree before moving due to their heavier bodies. They have lost their balancing tail. However mandrills dwell on the ground and only climb to the tree for protection. They are called the "dog-faced" monkeys because of elongated shape in order to smell on the ground rather than in the air.
OTHER RESOURCES FOR FURTHER LEARNING

Apart from the Museum's leaflets for learning ecology, the Museum recommends some resources on ecology for school children as well as for teachers, and selects some organisations in the UK concerned with ecology to obtain and a variety of information. All these books, packs and organisations are shown in Appendices 5.5 and 5.6.

In addition to these, Britain's newest conservation charity "Plantlife" has been introduced which relates to the Ecology Exhibition as follows:

*Plantlife* (The Natural History Museum, ND8)

- They are based at The Natural History Museum and aim to conserve and protect plants throughout the UK and abroad.
- They emphasize that plants are the basis of all life, hence the Ecology Exhibition presents the complex web of life which depends on plants.
- Their projects include:
  - buying ancient meadows,
  - researching the impact of global warming on plants,
  - campaigning for peatlands, and
  - recovering rare species" (Ibid).

c) OPENING EVENTS

As opening events for the Ecology Exhibition, from March 1991 onwards, some special lectures, videos, dramas and activities took place (The Natural History Museum, 1991f & 1991g). These events emphasized conservation of the natural world, human impacts on ecosystems and some animals' lives in harsh environments, a part of the study of zoology. The events which took place on March and May 1991 are listed below.
CONSERVATION OF THE NATURAL WORLD

• Conservation (video, 2 MAR 1991):
The problems of preserving the balance of nature, in habitats as diverse as tropical rainforests and polar ice caps.

• Rainforest conservation (talk, 6 MAR 1991):
The life of a small, rare monkey in one of the world’s most endangered tropical forests.

• Rainforest conservation in Ecuador (talk, 27 MAR 1991):
The strategies being used to save the Ecuadorean rainforests.

HUMAN IMPACTS ON ECOSYSTEMS

• Earth - the shadow of humanity (video, 6 MAR 1991):
The great natural process such as water, soil, air and climate must be kept clean and stable, hence humanity’s impacts on them must be studied.

• Earth - the coming of the green (video, 13 MAR 1991):
Humans are having a lethal effect on the earth.

• Earth - the view from space (video, 20,23 MAR 1991):
The prospects of our planet as a whole viewed from space.

• What on Earth (theatre, 28 MAR, 2-7,13 April 1991), (The Natural History Museum, 1991h):
This environmental theatre was commissioned by the Museum to complement its new Ecology Exhibition. The thirty-minute long play took a look at, in particular, humanity’s effects on the planet. This theatre blended opera, heavy metal rock playing, wire-walking and juggling, aimed, especially, at the 7 to 12 age group as well as all ages.

ANIMALS IN HARSH ENVIRONMENTS

• The parenthood game (video,10,20 April 1991):
The tribulations of parenthood in the animal kingdom including lions,
turtles and centipedes.

- *Pinkfoot* (video, 17 April 1991):
  The doom of a pair of pinkfooted geese as they struggle to raise their chicks on the tundra of the Icelandic highlands.

- *Birth of the red kangaroo* (video, 20 April 1991):
  The development of a young kangaroo, which tends to be born only one offspring at a time, from mating and conception to the neonate's (new born infant) journey up through the mother's fur into her pouch.

In addition to these, as an activity for learning ecology, an action-packed day of hands-on displays, talks, games and activities on the theme of "The carnival of science" took place on March 1991.

All these events were free with admission to the Museum, and prepared an induction loop facility for wheelchair users.

d) DISCUSSION

Through the investigation of direct and indirect education services relating to the Ecology Exhibition, this author has found a certain pattern of education services provided. These are illustrated diagrammatically in figure 5.4 below. Indirect services can be divided into 4 stages. Firstly, introductory resources inform the general public and teachers of the contents of the Ecology Exhibition. Secondly, the Museum's leaflets for learning ecology educate visitors about ecology in detail. Thirdly, to reinforce the study of ecology, some books on ecology are introduced for schools. Finally, to get further information or engage in some activities, several organisations concerned with ecology are introduced. These 4 stages are fundamental indirect services provided by museums. In addition, in the leaflets for learning ecology, there are no illustrations and many pages are quite high level to comprehend, but without diagrams or pictures, additional explanations would probably be
necessary in lectures and activities.

*Figure 5.4*

**INDIRECT SERVICES**

- INTRODUCTORY RESOURCES
- MUSEUM'S LEAFLETS FOR LEARNING ECOLOGY
- INTRODUCING BOOKS ON ECOLOGY FOR SCHOOLS
- RECOMMENDATIONS TO MAKE CONTACT WITH ORGANISATIONS CONCERNED WITH ECOLOGY

**DIRECT SERVICES**

EVENTS (VIDEOS; TALKS; THEATRE; ACTIVITIES)

*MAIN THEMES:*
- CONSERVATION OF THE NATURAL WORLD
- HUMAN IMPACTS ON ECOSYSTEMS
- ANIMALS IN HARSH ENVIRONMENTS

J. H. IGUCHI
1994
Direct services cover a range of services such as videos, talks, theatre and activities. They emphasize conservation of the natural world as well as human impacts on ecosystems. Normally ecology books describe living organisms and their physical environment in general including the human impacts which is not the main theme. Arguably in direct services, the human impacts need to be strongly emphasized which is one of the most urgent issues these days.

(C) PUBLICITY AND CRITICISM OF ARCHITECTURAL DESIGN

Around the time of the opening of the Ecology Exhibition, March 1991, many newspapers, magazines and telecasts discussed and publicized it of their own accord or by the NHM. These included some critical views on the new architectural design; the news of opening events by VIPs, especially the Princess of Wales; publicity and some information of the Exhibition through news media. All this media coverage is summarized as follows.

a) CRITICISM OF THE ARCHITECTURE AGAINST

Because of this modern architectural design within a Victorian heritage building, English Heritage was especially against this project. Private Eye, London (a satirical magazine) argued that "the Ecology Gallery has the great merit of doing no physical damage to the architecture, so can be removed when fashions in exhibition design change again, but it will nevertheless spoil a fine and sensible space" (Private Eye, 1990). A spokesman for English Heritage said that "the structures now in place will have to come down, and the architect asked to redesign" (Building Design, 1990). Also an architectural magazine "Blueprint" said that English Heritage, a body which is assuming more and more dictatorial powers, tells the NHM that Ian Ritchie's new ecology gallery is out
of keeping with the interior of Waterhouse's building" (Blueprint, 1990). More precisely Chartered Surveyor Weekly, London argued that "English Heritage and the Victorian Society are furious that the NHM is proceeding with interior works by Ian Ritchie, a strident Modernist not noted for exhibition design. English Heritage say his designs are wholly incompatible with and highly detrimental to Alfred Waterhouse's 1870s work, built under the patronage of Prince Albert" (Chartered Surveyor Weekly, 1990).

However the NHM and the architects had firm beliefs about the architectural design.

FOR

The NHM and the architects were interviewed by some journalists. In one article in Building Design, "The new structure is installed in the gallery on a no-touch basis: hence the intervention in the existing architecture is purely visual, not physical. The original perspective is maintained, and the higher reaches become accessible to the visitor's perception. It is Ritchie's stated intention to establish a clear visual dialogue with Waterhouse's architecture" (Building Design, 1990). Also Museum Development, a magazine of museums, summarized Ritchie's intentions as follows:

- "To create a one-way system through the gallery that would complement the narrative structure of the Exhibition, help orientate visitors, and manage the flow through the gallery.
- To create a series of spaces initially concerned from visitors, but revealed as they progressed through the gallery, to maximize interest and motivation.
- To create a design sympathetic with the original Waterhouse architecture, including the maintenance of a vista through the length of the gallery."

(Museum Development, 1991:30)
Also Roger Miles, the Head of Department of Public Services in the NHM, explained the intentions of the architectural design. He said that "the magnificent building is now wholly inadequate for its purpose" (Chartered Surveyor Weekly, 1990). He continued that "Everything art historians want to show can still be put in glass cases or hung on walls.... But our job is to explain science, and science is still evolving so a static pattern of display is just not sensible.... The best we can do is to avoid becoming another museum of a museum" (The Guardian, 1990a). In addition to these comments, he explained about the benefit which visitors might gain from this architectural design. He said that "visitors will be able to respond to this through the new exhibition structure and enjoy it by seeing it clearly.... A special benefit will be the opportunity to highlight the details with which Waterhouse adorned his building, including the walls and column heads" (Private Eye, 1990).

All in all, Bloomfield, the Museum’s manager of exhibitions, added that "What we are doing does not destroy the original concept (Kensington & Chelsea Times, 1990), and The Guardian quoted someone’s opinion that "The NHM has a particular responsibility to teach as many of its visitors as it can, and it should have the freedom to use the best, most up-to-date tools available to it" (The Guardian, 1990b).

b) NEWS OF OPENING THE ECOLOGY EXHIBITION

Naturalist David Bellamy opened it:

In spite of conflict between the NHM and English Heritage relating to the new architectural design of the Ecology Exhibition in the Victorian heritage building, it was opened on 8 March 1991 by the well-known naturalist, David Bellamy. Western Morning News, Plymouth reported that "NATURALIST David Bellamy yesterday opened the world’s first permanent multi-million pound global Ecology Exhibition. The massive display, in a towering "greenhouse" at London’s..."
Natural History Museum, concentrates on building visitors' understanding of the delicate balance that exists in nature" (Western Morning News, 1991). The headlines of these articles were variety, for example, "Green light" (Sandwell Mail, 1991; Birmingham Evening Mail, 1991), "Ecology first" (Lancashire Evening Post, 1991; Wrexham Evening Leader 1991), "Ecology show" (South Wales Evening Post, 1991; Halifax Courier & Guardian, 1991; Huddersfield Examiner, 1991; Coventry Evening Telegraph, 1991).

Princess Diana opened it:
Particularly newsworthy was that Her Royal Highness, Princess Diana, patron of the NHM was to formally open the Ecology Exhibition on 11 March 1991. The advance notice for this event was described by newspapers. For example, Chelsea News (newspaper) reported that "Princess Diana is set to unveil a spectacular new exhibition at the NHM the week after next. Ecology promises to give the visitor the sights and sounds of a tropical rainforest housed within a towering glass house. It will be the world's first permanent exhibition on global ecology. The centre will be formally opened by Princess Diana on Monday March 11" (Chelsea News, 1991). On that day, Princess Diana met the Exhibition's architect Ian Ritchie as well as more than 800 people (Shropshire Star, 1991). Roger Miles, the Head of Public Services in the NHM introduced the Ecology Exhibition to her (Colchester Evening Gazette, 1991). "Blueprint" (architectural magazine) summarized from the conflict between the NHM and English Heritage to the opening events in the article "ZERO GRAVITY" (Blueprint 1991). One of the articles is shown in figure 5.5, titled "Forest Walk" below.

c) PUBLICITY THROUGH THE NEWS MEDIA

Publicity for new exhibitions as well as existing exhibitions is important for the viability of museums. Effective publicity is especially vital if a museum
FOREST WALK: THE Princess of Wales walking through a model of a tropical rainforest with Dr Rodger Miles, head of exhibitions at London's Natural History Museum, when she opened its new Ecology Gallery

FROM COLCHESTER EVENING GAZETTE, 12 MARCH 1991

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wishes to highlight a particular issue or theme. In the case of having opened the new Ecology Exhibition, the NHM employed an advertising agency. "Media Week" reported that "Harari Page/The media Business has created a novel media approach to publicise the Natural History Museums's new ecology wing" (Media Week, 1991). The contents of these posters tried to catch readers' attention using some hyperbolic sentences such as:

- "The most important debate in the world today" (Evening Standard 1991a)
- "Looking at our planet's balance sheet, would you invest in its future? Or would you let the receivers in right now?" (Evening Standard 1991b)
- "Is our planet already little more than a condemned slum? Or can it still be home sweet home for mankind?" (Ibid)
- "After years of tampering with our environment, is it really curtains for the planet? Or can we still put the show back on the road?" (Evening Standard 1991c)

Also the "Sunday Mirror" (newspaper) offered free admission vouchers for young persons printed in the newspaper saying "The NHM, home of the dinosaurs have opened their exciting new Ecology Exhibition. Don't miss it" (Sunday Mirror, 1991). Some of these advertisement are shown in Figure 5.6 and 5.7 (pp243,244).

In addition, an advertisement was broadcast through TV, Channel 4, from around lunch time to 10 pm (from 1 to 4 times a day), using some logo patterns with music and voices. The scripts were as follows:

- "Shouldn't you think about some of the biggest questions in the world today? At the Natural History Museum's new Ecology Exhibition.
- Can the past really help us secure the future of our planet? Think about it at the Natural History Museum's new Ecology exhibition (Note: this underlined sentence follows each sentence below).
- As man increasingly tampers with nature, where will it all lead?
- Can you afford to ignore the most important debate in the world today?
- Should we be singing or crying about the state of our world?
- Just how long will this remain a green and pleasant land?"

(HARARI PAGE - advertising agency, 1991)

d) INTRODUCING THE ECOLOGY EXHIBITION THROUGH NEWS MEDIA

BEFORE OPENING

Apart from the NHM's own advertisements, the information was introduced by the news media of their own accord before the opening. Some examples of headlines follow: "Hi-tech exhibition is world first - Museum opens green display" (Kensington News, 1991); "The greenhouse effect" (Early Times, 1991); "Ecology - Greenhouse effect" (The Independent, 1991a; The Times, Educational Supplement, 1991). "Time Out" reported Neil Potter's intention (the Museum's director) that "stuffed animals in museums do not easily attract large audiences in a hi-tech leisure age.... Hence "Ecology", a new, 2.7 million pounds exhibition opening on March 8 aims to explain Life itself using only 30 or so specimens out of the 67 millions dead things housed in the museum's cavernous corridors" (Time Out, 1991). Roger Miles (the Head of Public Services, the NHM) added that "Which is the more real - the real thing on film or these dusty, stuffed creatures? .... We are in the education business but we have to make it pleasurable and entertaining to attract our audience" (Ibid). Furthermore, in terms of educational level, Bob Bloomfield, manager of the Exhibition said that "This is not for the academic study of ecology. It will form an introduction to children and adults who want to learn about the basic principles of life" (The Standard, 1991).
A major new exhibition opening today at the Natural History Museum.

ECOLOGY
Must end soon?

After years of tampering with our environment, is it really curtains for the planet?

Or can we still put the show back on the road?

Find out more about the most important debate in the world today, visit the new Ecology exhibition at the Natural History Museum.

It's open Monday to Saturday from 10am to 6pm. Sundays from 11am to 6pm.

ECOLOGY

South Kensington, Cromwell Road, SW7

The most important debate in the world today?

Our planet depends on a complex and fragile balancing act for its survival. A natural balance which some experts believe we have catastrophically tampered with. Is this really true? And if it is, what can we do to reverse the decline of our environment? Will putting our empty bottles into a bottle bank really help replenish the earth? Would denying your children a burger render them less able to help replenish the earth? And how will future generations deal with the decline of our planet and its natural balance?

To help you and your family understand better the complex arguments put forward, we at the Natural History Museum have just opened our largest single permanent exhibition, called Ecology, it explains in dramatic yet simple terms just how our planet lives and breathes. How earth's natural balance has been affected already by man. And how this generation can perhaps hand on to our children a planet which is improving rather than deteriorating. It's an exhibition which, in our view, everyone young and old needs to see. Otherwise, how can you have a view on the most important debate in the world today?

ECOLOGY

FROM EVENING STANDARD: 2 AUG 1991

£1.75

Free Admission for one young person with this voucher.

The Natural History Museum, home of the dinosaurs have opened their exciting new Ecology Exhibition. Don't miss it.
The Natural History Museum, Cromwell Road, London SW7 (S. Kensington Tube).
Open Mon-Sat 10.00-18.00 Sun 11.00-18.00.
Offer valid until 30th September 1991.
Young person (5-17 years).

FROM SUNDAY MIRROR: 4 AUG 1991
AFTER OPENING

After opening the Ecology Exhibition, the amount of information of the Exhibition increased through news media. Some examples of the headlines of these articles are that: "Roll up, roll up for the dancing dinosaurs" (The Independent, 1991b); "Museum buzzes with life" (Montreal Gazette, 1991); "Exhibit shows Earth’s ecology" (Toronto Globe & Mail, 1991); "Plight of the rainforests now in darkest London" (Southened Evening Echo, 1991); "Environmental exhibition without doom and gloom" (New World, 1991).

"The Independent" interviewed Giles Clarke, the Head of exhibition planning, about his aim of the Exhibition, and he replied that "Everybody has heard of the word ecology, but very few know what it means and many associate it with bad news. We have concentrated on the points people are vaguest about, to make something simple, pure and easily understandable" (The Independent, 1991c). And also "Young People Now" introduced this Exhibition with a photo of the Leaf Factory (a part of the Exhibition) with a young girl, and described the explanation of Gail Mckenzie (Manager of the Press Office in the NHM) that "The idea is that people should make up their own minds about the ecology of the planet" (Young People Now, 1991).

e) DISCUSSION

Through investigation of information of the Ecology Exhibition from mass media in terms of criticism of the architecture, and publicity, some crucial arguments by this author are as follows.

1. The argument relating to the new architectural design in the Victorian heritage building between English Heritage and the NHM is remarkable. They, each, have completely different ideologies supporting their own philosophical
viewpoints in terms of museology. However the Museum must bear in mind that it will be criticized by conservatives in terms of new design of exhibitions. This argument is one of the most serious issue in the museum world nowadays. In addition, both reformists and conservatives will rightly continue to argue about the educational impacts of different exhibition designs.

2. Publicity was achieved in two ways: by writing to the newspapers and posters; and TV. The former used certain pictures which were eye catching, although arguably this content did not suit young people. If the advertisements had been more geared to children, then they would have had more impact on them. About the latter in terms of TV advertisement, the museum broadcast only from channel 4, because of financial reasons. However probably it had a greater impact on the public, since the numbers of TV viewers are usually larger than the number of readers of a written advertisement in the press.

3. The news of the opening of the Ecology Exhibition by the NHM’s Patron, Princess Diana probably had a great positive impact on the public. Also, thanks to the biggest natural history museum in the UK and the largest permanent ecology exhibition in the world, many news media reported the Exhibition and informed the public. However, opening of small exhibitions in minor museums do not inspire the news media worlds. This means that the NHM has responsibility as a representative of the museum profession not only in the UK but also in the world, especially in terms of ecology exhibitions.

In addition, some technical articles in terms of the Exhibition design were unearthed in the media. These had both positive and negative viewpoints. The arguments will be examined in Chapter 6.
This section will analyse the Ecology Exhibition. As described in the methodology (Chapter 5, see pp200-203), this study considers the organisation of the Exhibition, interpretation, audio-visual effects, and physical conditions. The results of this study will be discussed from the viewpoint of museum studies. All sections from (A) to (D) include the results and the discussions.

(A) ORGANISATION OF THE EXHIBITION

a) SIZE OF THE EXHIBITION

This Ecology Exhibition occupies the right wing of the NHM. As showing in figure 5.8 below, the floor area is rectangular in shape. The distance from entrance to exit is approximately 220m in length, nearly half of a 400m running track. This distance is derived by combining routes such as ground floor chasm: 60m, ramp area:46m, mezzanine (1):42m, mezzanine (2):46m, 4 bridges together: 26m. The total area of these corridors is about 880m² excluding the exhibit area. In general, average people (adults) can walk 4000m an hour and therefore a distance of 220m can be walked in 3 minutes 30 seconds. However the average length of stay in the gallery was estimated around at 35 minutes by museum staff considering viewing time. This estimate is just ten times the time of walking along the corridors without stopping. According to summative evaluation in 1992, as many as 37% of visitors stayed for more than 30 minutes, according to questionnaire data (see Fig 4.13, p185). Consequently, the estimation of the length of stay is quite correct.

b) ADVANCE ORIENTATION
ECOLOGY MASTER PLAN  Fig 5.8

FROM:
THE NATURAL HISTORY MUSEUM, 1950

NOTE: DESCRIBING ENTRANCE, EXIT AND
ARROWS BY IOUCHI (THIS AUTHOR)/1:280

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Generally, museums inform the public about the outline of exhibitions using some leaflets, or information panels or banners at the entrance area of exhibitions. As mentioned above, for teachers, "A teacher's guide" is available. For general visitors, the leaflet "Guide" is prepared, describing 8 selected exhibitions including the Ecology Exhibition explaining that, "The Ecology Exhibition shows how air, earth, water and the sun's energy are critical to the survival of living things and examines the impact of human beings on the environment" (The Natural History Museum, ND9). Visitors are encouraged to view the Exhibition by reading this short information. Also, at the entrance area of the gallery, 4 banners describe the outline of the Exhibition's concept and BP's (British Petroleum - sponsor) intentions which are geared to adult readers.

c) TOPOGRAPHICAL ORIENTATION (1) - FLOW OF THE ROUTE (see p107)

No hand-held map and wall map have been prepared for general visitors. Visitors are given a leaflet entitled "Guide" describing how to find the exhibitions which they wish to see. Also visitors can see numbered signposts which show the direction of each gallery. As far as the Ecology Exhibition in terms of the route, wall maps or signposts are not necessary because of the one way system. First of all, visitors see a banner describing "Ecology" hanging in front of the gallery. Once visitors enter the gallery, naturally they can work towards the exit following arrow marks and the indication "This way" at some positions, such as the entrance of new corridors and bridges. For teachers with school children, a plan of the gallery described simply is available entitled "A teacher's guide - Ecology" shown in figure 5.9 below. Also the outline of the organisation of the Ecology Exhibition (written by this author) is shown diagrammatically in figure 5.10 and some colour photos of chunks in figure 5.11 below.
FLOW OF THE ECOCITY EXHIBITION IN THE NIM

Fig 5.9

GROUND FLOOR

Water cycle

RAMP

Savannah grassland

Life

Sun

Earth

Water

Air

Earth in space

CHASM

Rainforest experience

ENTRANCE

seats

Ecology

MEZZANINE LEVEL

Land

Water cycle

Oceans

Energy for life

Feeding and recycling

Human beings

The shifting balance

LIFT & STAIRS

EXIT

Energy

For

Life

Fig 5.9
ORGANISATION OF THE ECOLOGY EXHIBITION IN THE NHM

Fig 5.10

J. H. IGUCHI 1994

Overall Concept

ECOLOGY

LARGE SECTIONS

TITLES OF SECTIONS

TITLES OF CHUNKS

RAINFOREST EXPERIENCE

1. The Rainforest
2. Earth
3. The atmosphere
4. The hydrosphere
5. The lithosphere
6. Energy
7. The biosphere
8. Ecosystems
9. The water cycle

(1)
Introduction

INGREDIENTS OF LIFE

WATER CYCLE

(2)
Organisms
in the Oceans
& on the Land

OCEANS

10. Factors that limit
life - in the oceans

11. Factors that limit
life - on the land

(3)
Energy & Living
Communities

LAND

ENERGY FOR LIFE

12. Energy and sunlight
13. The leaf factory

14. What all living things need
15. The chain, the web, the pyramid
16. Nutrient cycles

(4)
Complex
Ecosystems

FEEDING & RECYCLING

17. Population balance
18. Environmental changes
19. Population together
20. How ecosystems grow

(5)
Human Impacts

THE SHIFTING BALANCE

17. Population balance

HUMAN BEINGS

21. Ecology
I. INTRODUCTION

[A] THE RAINFOREST
B] EARTH SCIENCE

(CHASM)

THE HYDROSHERE
[C] ECOSYSTEMS

[D] THE WATER CYCLE

-254-
2. ORGANISMS IN THE OCEANS & ON THE LAND

[E] OCEANS

[F] LAND
THE LEAF FACTORY

(BRIDGE)
[1] WHAT LIVING THINGS NEED

- FEEDING

(THE WEB)

(THE PYRAMID)
HOW ECOSYSTEMS GROW
5. HUMAN IMPACTS

[Q] HUMAN IMPACTS (1) - BULLDOZER

[R] HUMAN IMPACTS (2) - FILMS
In our hands...

rests the future of natural diversity
and the essential connection that...
d) CONCEPTUAL ORIENTATION (see p107)

First of all, at the entrance, the overall concept through a short sentence is shown on the plastic pole that says "Welcome to Ecology - where we explore the connections in the web of life - which means that each individual animal, plant, and person is just one component in a complex system." The Exhibition followed this conception can be divided into five large sections such as introduction; organisms in the oceans and on the land; energy and living communities; complex ecosystems; human impacts. And they consist of 21 chunks (see Fig 5.9 & 5.10, p250,251).

1. INTRODUCTION

It consists of three sub sections - "Rainforest Experience", "Ingredients of Life", and "Water Cycle. First of all, visitors can walk through a short walk in "The Rainforest" (chunk 1), and then, as ingredients of life, a model of "Earth" (chunk 2), quadroscopes such as "The Atmosphere" (chunk 3), "The Hydosphere" (chunk 4), The Lithosphere" (chunk 5), "Energy" (chunk 6) and "The Biosphere" (chunk 7), and "Ecosystems" (chunk 8) with some stuffed animals are displayed. Next, a largest quadrascope called "The water cycle (chunk 9) is shown. These are all on the ground floor.

2. ORGANISMS IN THE OCEANS AND ON THE LAND

This section is in the ramp area, and has two chunks - "Oceans" and "Land". The first chunk called "Factors that Limited Life - in the Oceans" (chunk 10), and the second one is "Factors that Limited Life - on the Land (chunk 11). Visitors can operate touch screens to study these.

3. ENERGY AND LIVING COMMUNITIES

This is on the mezzanine level, and can be divided into two, "Energy for
Life", and "Feeding and Recycling". In the former, "Energy and Sunlight" (chunk 12) shows the effect of sun energy on the earth, and also the system of photosynthesis is shown using a large model called "The Leaf Factory" (chunk 13). In the latter "Feeding and Recycling", the importance of feeding is described using some stuffed animals called "What All Living Things Need" (chunk 14). Next, "The Chain, the Web, the Pyramid" (chunk 15) are informed, and lastly "Nutrient Cycles" (chunk 16) are shown using some stuffed rabbits and a computer.

4. Complex Ecosystems

This consists of four chunks: "Population Balance" (chunk 17), "Environmental Changes (chunk 18), "Population Together" (chunk 19), "How Ecosystems Grows" (chunk 20). First three chunks use some stuffed animals, and the last one uses mainly panels.

5. Human Impacts

This shows namely human impacts on ecosystems using films called "Ecology" (chunk 21).

The titles of chunks are shown in the Exhibition gallery in the correct position, all of which are placed close to the chunks, and short descriptions follow the titles. On conceptual orientation, two questions are raised by this author:

1. The overall concept "Ecology" does not include the term "physical environment." Generally, the definition of ecology is the study of the relationships between living organisms and their "physical environment." Does it need to use this term in here? The Exhibition does not seem to want to describe the definition of ecology in here.
2. The title of the last chunk is "Ecology", not human impacts, although the contents relate to the human impacts on ecosystems. May the sound of the phrase "human impacts" as a title of the chunk be offputting for visitors?

All written guidance on conceptual orientation is shown in Appendix 8 and the analysis of the contents of the script is written in the section on "Interpretation" (see pp.270-276).

e) TOPOGRAPHICAL ORIENTATION (2) - LAYOUT (see Fig 5.11, pp.252-265)

This Exhibition is in the form of a one way system and the sequence of the route and chunks have been discussed above. As figure 5.11 (photos) shows, the Exhibition is not like traditional layouts which display objects with detailed information on the labels. Except in a few cases, almost all the displays consist of audio-visual systems, console panels and models. Each chunk informs visitors one specific theme with vitally important up-to-date technical terms on ecology and environmental study translated easily in a systematic way, so that visitors can select their own theme to study of interest to them. Some discussions on the layout raised by this author are as follows (Note: some descriptions are not found in the photos, figure 5.11, on account of limited space).

FEATURES WITH ARGUABLY MORE ATTRACTING POWER

The Rainforest (Photo A):

Two log-like artificial wooden benches in the rainforest to offer rest to the visitors for a moment.

The Water Cycle (Photo D):

Showing a film about the water cycle on the huge quadroscope which consists
of 20 TV screens and their pictures are reflecting in the mirrors around them to make a spherical shape.

Energy and Sunlight (Photo G):
The earth is holding an umbrella to show the effect of the atmosphere; the earth is in a greenhouse to tell the greenhouse effect; and the earth is wearing glasses to protect it from harmful UV rays (ultraviolet rays). All these ideas might make visitors understand more quickly the conception. Each model is displayed with written text together with colour pictures.

The Barn Community (Photo O):
The barn community is a reconstructed diorama using some stuffed animals with the added effect of the smells. Also, the sound made by animals are able to be heard when buttons are pushed.

FEATURES WITH ARGUABLY LESS ATTRACTING POWER

Ecosystems (Photo C):
Some peep-hole like windows showing visitors dioramas of the African savanna are narrow and they might not be suitable for all heights of visitors if they want to see the whole scene.

How Ecosystems Grow (Photo P):
This section shows how ecosystems adapt after natural disasters such as volcanic eruptions. In the most parts, this is achieved by panels. However some lettering is too small, and too distant for all visitors to read such as the section on "Lands of Opportunities"; "Nature Over Taken"; and "The Shape of Things to Come".

Human Impacts - Bulldozer (Photo Q):
Around the blade of the bulldozer, which is a symbol of human impacts on ecosystems, there are some panels to emphasize the description. However, white letters on the bright beige wooden panels is rather difficult to read since the contrast is not great and therefore visitors may not be attracted by these.
In addition, "Oceans (Photo E)" shows the factors of limited life in the oceans with 4 sections using 6 kinds of hi-tech method each, which are arranged vertically. Hence the information on the upper level might not attract visitors because of the distance from them such as the electronic information panels.

(B) INTERPRETATION

This section will discuss interpretation of panels and some labels (see p108) in terms of their placement, number of words and typeface, and contents. As has been mentioned before, labels are not frequently used in this Exhibition but relatively large panels are used for describing the conceptual orientation of each chunk, and detailed information is mounted on electric panels some of which have buttons to illuminate the texts called console panel (by this author) instead of on conventional labels.

a) PLACEMENT

The placement of the panels such as the height above the floor of the first line of the text, and the distance from readers have been measured by this author, not using museum data (because it is not available). Except for a few panels which are hard to measure, nearly all of the panels for conceptual orientation for chunks have been measured. A few cases have been written on the inclined plane at a reasonable height so that readers can read it easily (For example, on the stump-like surface with a height of 100mm at the entrance of the "Ocean"). As to the distance from readers, except for a few panels which have been installed beyond guardrails or objects, most panels are able to be approached close enough to be legible. However the panels with detailed information in the section "How ecosystems grow" (see Photo P, p263), have been installed beyond guardrails and some of them are quite hard to read.
Most panels have been installed on the wall, and 20 of this type of panel have been measured in terms of the height of the first line of the text. The result is: Range 97-205mm; Mean 172.5mm (157.3-187.7 with 95% CI - Confidence Interval), (see p155,156); Median 190mm. The ideal height might be maximum 215mm if a vertical eye level is 158mm (5'3''); distance from viewers is 158mm; and field of vision is 40° (Witteborg 1981:13), [Note: Maximum Vertical Eye Level (215mm) =158 mm ×(1+tan 20)]. As seen the result in figure 5.12 below, the highest level and "mean with 95% CI" are all within the ideal maximum vertical eye level 215mm. Consequently, the placement of these panels has been successful. The raw data is shown in Appendix 9.

**Fig 5.12**

**HEIGHT OF THE FIRST LINE OF THE TEXT IN THE PANELS**

**IN THE ECOLOGY EXHIBITION, THE NMM**

<table>
<thead>
<tr>
<th>N</th>
<th>RANGE</th>
<th>MEAN</th>
<th>MEDIAN</th>
<th>SD</th>
<th>MEAN 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>108(97-205)</td>
<td>172.5</td>
<td>190</td>
<td>34.0</td>
<td>157.3-187.7</td>
</tr>
</tbody>
</table>

b) **TYPEFACE AND NUMBER OF WORDS**

**TYPEFACE**

The text used in this Exhibition can be divided into four types such as conceptual orientation for large chunks; sub-information; object labels; and console panels. Sub-information and object labels are not used so much. Some object labels are still use relatively small letters (Note:they were not be able to be measured in terms of typeface because they were inside glass cases) such as the section "What all living things need" displayed some stuffed animals.
As to the text on the console panels, which are used instead of conventional labels, they might have no problems in terms of the typeface except in extreme cases, because they are well lit. In "The Barn Community", for example, which is a reconstructed barn using some stuffed animals, height of letters on the console panels, are from 7mm to 15mm. These sizes can cover the ideal minimum size 24 point for object labels (about 6mm in height for a capital letter "A"), (see p111). The typeface used for conceptual orientation for large chunks are relatively large. The "mode" of letters'height for titles is 50mm, and for sentences is 20mm, and these sizes are satisfactory given the ideal minimum size 72 point for panels (about 15mm in height for a capital letter "A"), (see p111).

NUMBER OF WORDS

As to the text on the console panels, most numbers of words per sentence are under 22, which is within the ideal maximum number (see p110). Some longer sentences consist of around 25 words, which are not too overloaded. Throughout all the text, the technical method of layout such as indentation, layering information, and buleting are frequently used (see p112). As long as conceptual orientation for large chunks, about 33% of sentences are compound sentences joined by hyphens or bullets, hence, they are relatively longer. However they are easier to read than the same length of sentence without such aids.

Figure 5.13 below shows the number of words per sentence without compound sentences on the panel for conceptual orientation in large chunks. As shown, the "range" is from 4 to 24, "median" is 14, and "mean" with 95% CI (confidence interval) is from 12 to 15. Except for a few sentences, most numbers are under 22, and the mean is 13.4 which is also a reasonable number (see p110). In addition, as shown in the same figure, 24 these types of panels have been measured in terms of number of words per panel including compound sentences.
The result is that range is from 10 to 82, median is 44, and mean with 95% CI is from 39 to 52. The mean is under 75, which is ideal maximum number (see p110). The raw data is shown in Appendices 11 and 12.

### NUMBER OF WORDS PER SENTENCE AND PER PANEL

**IN THE PANELS IN THE ECOLOGY EXHIBITION, THE NUM

<table>
<thead>
<tr>
<th></th>
<th>RANGE</th>
<th>MEAN</th>
<th>MEDIAN</th>
<th>SD</th>
<th>MEAN 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PER SENTENCE</strong> *1</td>
<td>20(4-24)</td>
<td>13.4</td>
<td>14</td>
<td>5.3</td>
<td>12-15</td>
</tr>
<tr>
<td><strong>PER PANEL</strong>     *2</td>
<td>72(10-82)</td>
<td>45.5</td>
<td>41</td>
<td>16.1</td>
<td>39-52</td>
</tr>
</tbody>
</table>

*1: without compound sentences  
*2: including compound sentences

Fig 5.13

**J. H. IGUCHI 1993**

**c) CONTENTS**

**UNDERSTANDING LEVEL OF CONTENTS**

As mentioned above, throughout the Exhibition, relatively short sentences and short length of text are used, and also words used are not so difficult to understand and are probably suited for the minimum target age of 15. The interpretation can be divided into three levels such as conceptual orientation for large chunks which seem to try to correct misconceptions; more detailed text; and object labels or mounted text on the console panels. The last one might be still easy to read and understand for the target age of 15. Also, some
short quotes made by famous people are described on the glass wall in the chasm section on the ground floor. These contents contain more advanced language, hence they may be suitable for adults.

FORM OF CONTENTS

According to Witterborg L.P., passive sentences should be avoided if possible in order to read the text smoothly. However, sometimes without a passive voice, it is not easy to construct a sentence. In the Exhibition, a total of 22 passive sentences are used, and of those, only 10 are for conceptual orientation. In addition, some emotional descriptions such as suggesting the use of other senses such as smell, hearing, and touch are not used a great deal, however, other strategies are used to encourage visitors to understand the subject matter. Some examples are as follows:

- The Rainforest:
  "As you walk through the rainforest, think of all the different life forms...."

- Ecosystems:
  "Take life in the African grassland ecosystem. How is it organised?"

- What all living things need:
  "Look out for the [stars] and [circles]."
  (Note: stars as energy and circles as raw materials are used in the text)

- Population balance:
  "Look closely at the natural world and you’ll find that it is in constant flux."

- Population together:
  "Look into the barn to see how its residents affect each other."

One sample of the panel with an illustration is shown in figure 5.14 below.
We act as if we are separate from nature ... ... as if nature is a free resource for us to exploit.
Furthermore, all interpretations are described in English. In the museum world, recently, the idea of using a range of languages for interpretation has been debated. However since English is such a dominant world language, the interesting debate is whether museums in English speaking countries should offer other languages in their displays.

(C) AV-EFFECTS

This Exhibition seems to depend for its educational effect in terms of cognitive and affective outcomes on mostly so-called AV (audiovisual) effects. This is one of the Exhibition's policies hence up-to-date AV technologies are frequently used. Some examples of these include: 26 Barco monitors (for quadroscopes); 25 Kodak Carousels; an NBC GP 3000 data projector (for films at the last section); 12 Weyrad sound-boards; 9 ENSA 24 solid state audio systems; 13 pairs of speakers; 14 Sony LDP 1600 videodisc players; 5 touch screens; 20,000 pounds worth of fibre optics (800m - for quadroscopes), (Audio Visual, 1990). The AV effect of each exhibit has been examined and is summarized below.

The Rainforest
This is a two-part walkable diorama. All plants such as palm trees, bird-of-paradise flowers and ferns, and wooden benches are made from plastic, but they look very similar to natural plants. Walking on the short path, some sound effects can be heard such as the sound of a waterfall, singing cuckoos, cawing crows and chirping cicadas. Visitors might wish that the path was a bit longer.

Earth Science in the chasm
Some smaller quadroscopes such as, "The atmosphere", "The hydrosphere" and "Energy" show a dynamic earth and sun. It might attract viewers. However they are not scientific descriptions but just fun, because the pictures on the globe
are many reflections brought together by some mirrors surrounding the source picture to make a spherical shape. Consequently the descriptions are not natural movement of air and tide, and "prominence" of the sun. Another quadroscope used in this section describes "The lithosphere". Also "The biosphere" uses a mirror effect showing 17 kinds of animals within a two minute slide.

Ecosystems

Two mannequin cameramen are taking wildlife films peeping into a diorama of an African grassland from a chink in the frosted glass wall, and two monitor screens behind them are showing the same films. The screen size is about 13-inch (33cm diagonal) and the height of the centre of screen is 78cm. Three kinds of short films are seen and each film lasts less than 2 minutes. Total watching time is approximately 5'10" (ideal length of the show might be less than 12' - see p202) and there is no waiting time. They are able to be watched by many visitors at the same time.

The Water Cycle

A large quadroscope shows the journey of water around the earth, that is evaporation by the sun's energy; becoming cloud and rain; giving it as essential nutrient to plants and animals; back to the sea; evaporation again. The length of film is about 3'20" and waiting time is 30" (ideal length of the waiting time might be less than 10' - see p202) which is being counted down by a narrator showing currents of water. It consists of 20 TV screens and their pictures are reflecting mirrors around them to make the earth appear like a spherical shape. This is set up at the end of the chasm, and the width of front of it is 4.6m, hence some family groups can watch together at the same time. In addition, at the top of a ramp corridor, this quadroscope can be seen again but it seems to be wider than before. The picture is clear and this is arguably the
most exciting exhibit in the Ecology Exhibition.

Factors that Limit Life - in the Oceans
This consists of 4 sections, each of which shows 6 kinds of hi-tech devices arranged on the wall vertically. They show each different part of sea such as "deep sea", "open sea" (shallow sea), "rocky shore", and "coral reef". The bottom part is 3 handsets each which lasts about 20" with clear narration. The second level shows each diorama which is bright and colourful, so might be attractive to visitors. And other levels are slides and an electronic tape. The latter is probably less attractive because it is too distant for visitors to read.

Factors that Limit Life - in the Land
There are 4 sections describing living things on land using a touch screen each and slides shown on the model of stone henge-like screen board. The touch screen is 13 inch (33cm diagonal) and the height is about 65cm, which primary school children (under 12 years old) can touch it easily. One example of their contents is the comparison of some types of climates in terms of the ecology of plants. These descriptions are simple and pictures are clear. The slides on the wall show landscapes with plants and animals, and there are not very clear. Probably they give just enjoyment to visitors.

Energy and Sunlight
Alongside a corridor, some console panels have been installed. Behind them, there is a space diorama which is about 11 m in length showing sun and earth with the sun's rays. Between the earth and the sun, 6 kinds of picture are projected in sequence. However these pictures are not very clear. Probably the purpose of these are to enhance artistic effects on the diorama.

The Leaf Factory
This section shows the process of photosynthesis using a diorama of enlarged organs inside a leaf. With narration by a man, some parts are lit with some colour as they are referred to and this makes it easier for visitors to comprehend. It lasts about 2'30". The man's voice is husky and has a strong dialect, hence some visitors might be rather put off by his explanation.

The Pyramid
The ecological terminology "the pyramid" is introduced and explained using illustrations which change in sequence that is, plants - herbivores - carnivores - dead - bacteria, with an electric graphic board made into a pyramid shape. During this process, 5 handsets explain the sequence which lasts about 2'10".

Nutrient Cycles - a Rabbit's Life
Seven cases are installed in a row exhibiting stuffed rabbits showing a life of a rabbit and the death which is contributed to recycling the nutrient to grow plants for another rabbit. Each case is lit in sequence with a conversation between a mother and a child (young girl) concerning this process. It lasts about 1'15". Perhaps the child's voice might attract small children.

Nutrient Cycles - computer
This computer - a kind of touch screen - shows the journey of a carbon atom through living organisms. Visitors can choose different sequences of the journey. The size of the screen is 26 inch (about 65cm diagonal) and the height of the centre is 90cm. This section is probably more suitable for older children and adults. However one computer is not enough in the crowded case for others who wish to operate, but during operating by a visitors, there is enough space around the computer to make others watch the screen.

Environmental Changes
This describes the adaptation of living things to environmental changes in natural phenomena and together the unusual changes by humans which can so disrupt ecosystems. 5 kinds of boxes rise up and are lit alternately showing a diorama of adaptation. When one diorama rises up, 5 video screens show the same picture describing the changes and tragedy of animal lives through the human impacts on ecosystems. The height of the video screen is 1.5m. It is within the ideal field of vision.

**Population Together - The Barn Community**

This is a reconstructed diorama describing an animal community in a barn using some stuffed animals such as a cat, mice, a fox and some birds. It also includes a range of smells. There are 6 kinds of console panels with button switches in a row. When pushing a button, a specific part of the scene is spotlighted and some animal sounds can be heard. The diorama has been constructed to resemble a natural barn with olfactory and hearing senses, hence it is arguably attractive to visitors, from children to adults.

**Human Impacts - Bulldozer**

The full-scale shovel of a bulldozer which is intended to symbolize human impacts on ecosystems is moving back and forth, and on the shovel, short slides are projected describing human impacts using pictures and text. The time cycle for the shovel's movement is 14", and the slide lasts 1'20". Owing to the colour of the shovel (brown), the slides are not very clear.

**Human Impacts - Films**

There is no chair for audiences. The screen is an upper half part of a glass wall which is 1.8m in width and 3.2m in height from the floor. The height of the bottom of the screen from the floor is about 1.6m, however there is enough room to watch it a distance from the screen. There are 5 short films each of
which last on average 1'10'' and total 5'50''. They describe human impacts on
finite resources such as fossil fuels, chemical toxin waste put into the sea,
wooden doors coming from rainforest and contaminated drinking water. The film
concerning chemical toxins shows a computer game played by 2 children to explain
that larger fish have more toxins which possibly will be eaten by us. In the
video game era, this arguably is attractive to children.

(0) PHYSICAL CONDITIONS

This sub-section examines the physical conditions of the gallery climate
including RH (Relative Humidity - see p203), temperature and lux (see p101), as
well as safety features, and facilities for handicapped visitors.

TEMPERATURE AND RH

Unlike general natural history exhibitions or art exhibitions, the Ecology
Exhibition mainly consists of models, dioramas, videos and films. Hence
temperature and humidity in the gallery are not major considerations for the
relatively small number of animal specimens displayed there. According to
London’s climate, annual average temperature is similar to this of late October
to early November that is approximately 10° C, and the monthly rainfall is
nearly constant all year round that is around 50mm (Bishop & Prosser, 1992:8).
Hence the temperature and the humidity in the gallery have been measured in the
mid-autumn, on 5 November. A thermometer (thermograph type) and a hydrometer
(Hair and paper dial hygrometer type) are put on some parts in the gallery till
they showed correct degrees. The results are that the mean of temperature is
20.7° C which is within ideal degree: 20° ± 5° C, and the mean of RH is 54.5%
which is also within ideal percentage: 50%±5% (see p203). These are shown in
figure 5.15 below.
This Exhibition is different from many natural history exhibitions which tend to use many more animal specimens. Hence climate control is not as serious a problem such as UV (Ultraviolet) rays radiation, rather the control should be for visitors' comfort in terms of illumination measured in units called "LUX". LUX meter (photometer) was put on some parts in the gallery till it showed correct degrees. The results have been divided into 3 categories that is: sections with stuffed animals; sections without stuffed animals; and non-exhibit areas. Most of the LUX around stuffed animals is under 50 which is within ideal maximum LUX: 50 (see p203). The section "Environmental Changes" is only 2.3, because it shows video films, and stuffed animals are temporarily

<table>
<thead>
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<th>SECTION</th>
<th>(C)</th>
</tr>
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<tbody>
<tr>
<td>THE RAINFOREST LAND</td>
<td>19.5</td>
</tr>
<tr>
<td>HUMAN IMPACT (GREEN MAN)</td>
<td>20</td>
</tr>
<tr>
<td>MEAN</td>
<td>20.7</td>
</tr>
<tr>
<td>LAND POPULATION BALANCE</td>
<td>55%</td>
</tr>
<tr>
<td>MEAN</td>
<td>54.5%</td>
</tr>
</tbody>
</table>

Date: 5 November 1993
around 2 pm
lighted. The sections without stuffed animals are quite dark, because they use films, console panels and a computer. Within them, "The Web" is the brightest because this is a wide electric information panel. Non-exhibit area are corridors, bridges and a stair case. The mean of LUX of the rump area is 0.8, because the exhibit around these use slides or touch screen, however as long as walking on the corridor it might be too dark for some visitors. These data are shown in figure 5.16.

**CLIMATE (LUX) IN THE ECOLOGY EXHIBITION, THE NHM**  
*Fig 5.16*

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<table>
<thead>
<tr>
<th>SECTIONS WITH STUFFED ANIMALS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>ECOSYSTEMS</td>
<td>40.0</td>
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<tr>
<td>FEEDING (LION)</td>
<td>50.7</td>
</tr>
<tr>
<td>NUTRIENT CYCLES</td>
<td>22.0</td>
</tr>
<tr>
<td>(RABBITS)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>THE RAIN FOREST</td>
<td>3.6</td>
</tr>
<tr>
<td>THE WATER CYCLE</td>
<td>3.8</td>
</tr>
<tr>
<td>OCEANS</td>
<td>1.6</td>
</tr>
<tr>
<td>LAND</td>
<td>0.7</td>
</tr>
<tr>
<td>ENERGY AND SUN LIGHT</td>
<td>1.7</td>
</tr>
<tr>
<td>THE LEAF FACTORY</td>
<td>4.0</td>
</tr>
<tr>
<td>THE WEB</td>
<td>463.0</td>
</tr>
<tr>
<td>THE PYRAMID</td>
<td>10.5</td>
</tr>
</tbody>
</table>

| ENVIRONMENTAL CHANGES           | 2.3 |
| POPULATION BALANCE              | 32.3 |
| THE BARN COMMUNITY              | 13.8 |
| NUTRIENT CYCLES (COMPUTER)      | 5.3 |
| HOW ECOSYSTEMS GROW             | 3.8 |
| HUMAN IMPACTS                   |     |
| (BULLDOZER)                     | 1.7 |
| (FILMS)                         | 10.9 |
| (GREEN MAN)                     | 6.4– |
|                                 | 24.5 |
SAFETY FEATURES AND FACILITIES FOR HANDICAPPED VISITORS

Emergency doors and fire extinguishers are provided, and at the entrance of each bridge, the "FIRE EXIT" is described. Anti-skid floor boards or carpets are used throughout the gallery. In addition, braille indications or hands on exhibits, which visitors can touch museum objects, for handicapped visitors have not been installed. However, they can operate some console panels and touch screens. Furthermore, they can go through the gallery by wheelchairs, because between grand floor and mezzanine level is a ramp corridor, and at the last section, a lift can be used.

This chapter has looked into the profile of the Ecology Exhibition from a range of angles using the methods of museum studies and statistical analysis. First, the sponsor's objectives have been examined. Second, the overall strategy for the Exhibition, the architectural design, educational materials, and publicity have been investigated. Lastly the Exhibition itself has been examined in terms of organisation, interpretation, AV effects and environmental control and safety. Based on this research in depth, it can be said that the design has been generally successful.
CHAPTER 6

PSYCHOLOGICAL ANALYSIS OF THE ECOLOGY EXHIBITION IN THE NHM, LONDON

VISITORS AND THE WATER CYCLE IN THE ECOLOGY EXHIBITION. THE NHM
(THE NATURAL HISTORY MUSEUM - CATALOGUE, 1991)
This chapter will examine the Ecology Exhibition from a psychological point of view. The previous chapter 5 also included some psychological analysis as a part of the evaluation of the Exhibition, but that analysis did not use the data gained from visitors' attitudes or behaviour in the Ecology Exhibition. This chapter will analyse the Exhibition using data from visitors. The methods vary dependent on the particular objective, such as observation, questionnaire and interview. These methods have been specially designed by this researcher to collect reliable and valid data. To begin with, for each element, a pilot analysis was conducted to help predict the tendency of the main data or to redesign the method. Through this case study, substantial amount of data have been gained leading to some significant results. The results and discussions based upon them will be described in each study.

[1] OBSERVATION

A large scale observation in the Ecology Exhibition was conducted in autumn, 1994, about 3 years since it opened. The number of visitors observed was approximately 500. The analysis consists of: "Visitors' Length of Stay" (VLS); "Attracting Power" (AP); "Rating Holding Power" (HP); and "General Observation" (GO). They are almost all original methods and therefore the detailed methodology will be described in each section (see also the outline of methodology in chapter 4, pp204-207). The results and analysis are as follows.

[A] VISITORS' LENGTH OF STAY IN THE GALLERY (VLS)

a) METHOD
There are some methods of measuring visitors' length of stay in museums or exhibitions which have been undertaken by some evaluators (see pp.115-119). However, most of them lack reliability, since even the method of "Visitor Tracking" might generate false values owing to the intrusive nature of the approach. The method in this research has been specially designed to generate valid and reliable data. The procedure is shown below.

1. The researcher sits near to the entrance which is close to the exit.
2. Note the length of stay of a solitary subject or a group subject. First of all, try to memorize as much of the subject's figure and appearance as possible, and write these down on the paper, for instance, sex, estimate of age, clothes and belongings alongside the starting time. For a group, guess if it is family or another type of group, and count the number of members in the group. If the researcher cannot memorize these properly, the data is not used for the study.
3. Note the exact time when the subject is about to leave the gallery. If there is any doubt, such as uncertainty of recollection of the subject's figure or appearance, the data must be rejected.
4. Once started, the noting down of data must be continued until it is completed except for researcher's rest times. The researcher must not exercise any preference for the cases observed.

The raw data is to be found in Appendix 13.

b) PILOT STUDY

The pilot study was completed on 14 November, Sunday, 1993, between 12 and 5 pm. Visitor density was "fairly crowded". The number of subjects were 50 which included 12 families, 29 groups except school groups, 5 solitary males and 4
solitary female. The results were: average of the length of stay was 14.3 minutes; the range was 46 minutes (7 to 53); mean with 95% CI (Confidence Interval) was 12 to 16.5 minutes. If the extreme data was rejected, which was 53 minutes, the mean was 13.2 minutes. The distribution of the data was: under 15 minutes was 70%, 15 to 30 was 26%; 30 to 60 was 4%; and over 60 was 0%. The results show that most visitors spent under 15 minutes at the Exhibition, and this data is quite different to the results of the summative evaluation undertaken in 1991 which showed that as many as 37% stayed more than 30 minutes, according to the questionnaires (see p185).

If the results of this pilot study is relatively correct, the mean of length of stay in the main observation will be predicted to be around 14 minutes. Also the pilot study showed how difficult it was to memorize the subjects' appearances. It suggested that it would take quite a few days to obtain 100 data by one researcher.

c) MAIN STUDY

Main data collection was completed on 20 to 24, and 30 November, for 6 days in 1993, including a Saturday and a Sunday. The starting time was 10.30 am and

(1) Visitor density in the Ecology Exhibition defined by this author can be divided into 3 as follows:

Less crowded: the number of visitors on the ground floor is up to about 10.

Fairly crowded: the number of visitors on the ground floor is more than 10, and they can view exhibits without forming a long queue.

Very crowded: visitors can view exhibits with difficulty because of crowding. Sometimes they must wait for viewing one object for more than one minute.
finished at 5.20 pm. The visitor density was on week days, mornings and late afternoons around 4 o'clock was "less crowded", and mid-afternoons around 2 o'clock were "fairly crowded", however at weekends around 5 o'clock (free admission starts), it was "very crowded" with family groups. The number of "subjects" were 100 that is 50 solitary visitors and 50 groups including families but excluding school groups.

The results were as follows: mean was 14.1 minutes (pilot:14.3); range was 45 minutes (4 to 49); and mean with 95% confidence interval was 12.5 to 15.8 minutes. According to the distribution of the data, less than 15 minutes was 64 % (pilot:70%), 15 to 30 was 30%; 30 to 60 was 6%; and over 60 was 0. These results were not very different to the results of the pilot study. The 95% CI (Confidence Interval) shows that most visitors stayed under 15 minutes and the visitors who stayed more than 30 minutes were rare.

In large museums, like the NHM, general visitors arguably wish to see as many exhibitions as they can in the limited time they are in the museums. If they spent about 30 minutes in each exhibition, then they could only see a few exhibitions as well as visiting museum shops or a cafeteria in 2 hours 45 minutes, which was the time obtained by the visitor survey of the NHM, 1991 (see p169). The results are shown in figure 6.1 below.

VLS (VISITORS' LENGTH OF STAY) IN THE ECOLOGY EXHIBITION, THE NHM  Fig 6.1

(MINUTES) J. H. IGUCHI 1993

<table>
<thead>
<tr>
<th>N</th>
<th>X</th>
<th>RANGE (MINUTES)</th>
<th>SD</th>
<th>MEAN (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>14.11</td>
<td>45 (4-49)</td>
<td>8.22</td>
<td>12.5-15.8</td>
</tr>
</tbody>
</table>
d) STATISTICAL TESTS BETWEEN TWO VARIABLES

Firstly, the difference between solitary visitors and groups was examined. In the former's data, the mean was 13.1 minutes (SD [standard deviation]: 7.57), and in the groups' data, the mean was 14.9 minutes (SD: 8.8). The result of t test (Unrelated t test, see pp151,152) was p>0.2 (t=1.1; df=98). This shows there is no real difference between solitary visitors and groups in terms of the length of stay. Secondly, the case of males and females was examined. Each group members were 25. The males' mean was 15.3 minutes (SD: 8.9), and the females' mean was 10.9 minutes (SD: 5). The result of t test was p<0.05 (t=2.1; df=48).

Therefore, the difference between the results of the males and females is significant. The result, p<0.05, is not so highly significant, but, it can be said that there is some statistical difference between two groups. However some other factors may have influenced the results such as the difference between
occupations. By observation it was very difficult to guess a precise occupation correctly, but the age was possible to estimate. The average age of males was 40, and females was 30. The difference in age between the 2 groups is not considerable. Consequently, it might be said that males have concentrated more on viewing the Exhibition than females. These results are shown in figure 6.2.

### DIFFERENCE BETWEEN MALES AND FEMALES IN TERMS OF VISITORS' LENGTH OF STAY (VISITORS' LENGTH OF STAY) IN THE ECOLOGY EXHIBITION, THE NIM J. H. IGUCHI 1993

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>RANGE</th>
<th>SD</th>
<th>t test</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALES</td>
<td>25</td>
<td>15.3</td>
<td>29 (5-34)</td>
<td>8.9</td>
<td>t = 2.1</td>
<td>48</td>
</tr>
<tr>
<td>FEMALES</td>
<td>25</td>
<td>10.9</td>
<td>17 (4-21)</td>
<td>5.0</td>
<td>p &lt; 0.05</td>
<td></td>
</tr>
</tbody>
</table>

In order to ascertain the favourite sections for visitors, attracting power and rating holding power were measured. From 21 chunks (see p251), 5 small sections were chosen. These were: "Ecosystems" (in the chasm), (for pilot and main), "The Leaf Factory" (for pilot and main); "The Web" (for main); "Bulldozer" (human impacts), (for main); and "Films" (human impacts), (for pilot and main). They are all similar size. Ideally all chunks should be measured. however, it is almost impossible to do so in a limited time and with only one researcher. The reasons for the choice were as follows.

[B] ATTRACTING POWER AND RATING HOLDING POWER (see p205)
1. *Ecosystems*: This is an introductory section on ecology which consists of 2 parts that is (a) Stuffed animals, and (b) African grassland, with a video monitor in front of each section. This design is novel since the exhibits are beyond the frosted glass wall with slits for peeping through. The second section (b) was observed to count the AP and HPr because visitors might have had an experience of peeping the section (a), hence this experience might influence on their AP and HPr at section (b), such as their interest in peeping.

2. *The Leaf Factory*: The photograph of this section, which is an enlarged diorama inside a leaf, has been frequently introduced in magazines, newspapers, and used for a picture post card produced by the NHM.

3. *The Web*: This is one of the most important technical terms. This section is installed between "Chain" and "Pyramid" which are also very important terms.

4. "Bulldozer" and "Films": The chunk of "Human Impacts" consist of 3 parts that is "Bulldozer", "Films" and "Greenman"(which is a human). From a viewpoint of environmental educational point of view, these sections are vitally important. Hence 2 sections which have moving factor and/or AV effects that is "Bulldozer" and "Films" have been chosen, because both effects are also important methods of designing exhibitions these days (see pp103-105).

In addition, "Water Cycle" using a quadroscope is arguably the most exciting section and everybody wants to stop to see at this. Furthermore, "Barn Community" has 5 console panels, so it is difficult to measure AP and HPr. Hence they were not chosen.

a) METHOD

The definitions of AP and HPr have already been discussed in chapter 4 (see p205), however more detailed definitions of these made by this author are as
follows.

**AP (Attracting Power):**
The percentage of visitors who stop over 5 seconds to view the exhibits at a selected section.

**HPr (Rating Holding Power):**
"Holding power (HP) is a measure of time spent viewing an exhibit. Often used as a ratio of average viewing time by uncued visitors as a fraction of average viewing time of visitors who are cued (asked to study all aspects of the exhibit) (Centre for Social Design, 1988:8). The results might be useful to ascertain roughly visitors' favourite exhibits. However the weak point of this measurement is that the result varies depending on the choice of the experimental group in terms of their interest in the subject, understanding level and ages. In addition, measuring of viewing time of experimental group is an intrusive method as well.

On the other hand, the method of measurement of HPr (Rating Holding Power) uses actual viewing times obtained by an unobtrusive method. The procedure of the measurement is as follows:

1. Measure unobtrusively the length of visitor stop over 5 seconds to view the exhibit selected in the Exhibition and calculate the mean of the data that is "Average Viewing Time" (AVT).

2. Then, divide AVT by VLS (Visitors' Length of Stay in the whole exhibition obtained by a unobtrusive method).

HPr indicates a rate of VLS at each exhibit in the gallery, hence if comparing some exhibits in terms of HPr, the feature of these exhibits must be considered in terms of size and amount of information.
The results and discussion of these measurement are as follows. In addition, all raw data of this study is inserted in appendix 14.

b) PILOT STUDY

The pilot study was conducted on Friday 19 and Saturday 20 November in 1993 when the Exhibition was "fairly crowded". The number of those sampled for measuring AP in the selected sections was 40 each that is 20 solitary visitors and 20 groups each. The results were that "The Leaf Factory" was 50%; "Ecosystems" was 35%; "Films" was 18%. "Films" were therefore relatively unpopular. In the study of HPr, the number of those sampled was 30 each, that is 15 solitary visitors and 15 groups. The reason for observing smaller numbers of HPr than AP is that this job was very time-consuming, because to obtain the HPr data of the same number of AP data, it needs 4 times the time of obtaining AP data in "Films" for example. The result of HPr was that "Ecosystems" was 1.3%; "Films" was 3.7%; and "The Leaf factory" was 4.5%, that is, visitors spent 4.5% of their length of stay in the Exhibition at a section of "The Leaf Factory", for example.

From these results, the AP of "The Leaf Factory" was the highest (50%), and "Films" were the lowest (18%). Also, the HPr of "The Leaf Factory" was the highest, and the lowest was "Ecosystems". The mean of viewing time of "The Leaf Factory" was 38 sec; "Films" was 32 sec; and "Ecosystems" was 11 sec. In the main study, the important check points are that if the AP of Films (lowest) and the HPr of "Ecosystems" (lowest) will be shown.

c) MAIN STUDY

The main study was undertaken on 25 (Thu), 29 (Mon), 30 (Tue) November and 7 (Tue) December, 1993. These days and times were chosen since the visitors
density was judged to be "fairly crowded". The number of the samples of AP at the selected sections was 60 each, that is 30 solitary visitors and 30 groups, and HPr was 30 each, that is 15 solitary visitors and 15 groups. The results and discussion are as follows.

RESULTS

AP (Attracting Power):

The results of AP at each of the 5 selected sections were that "The Leaf Factory" was 42%; "Bulldozer" was 37%; "Ecosystems" was 35%; "The Web" was 27%; and lastly "Films" were 15%. The data was close to the results of pilot, such as "Films" which were the lowest (pilot:18%), and "The Leaf Factory" which was the highest (pilot is 50%).

HPr (Rating Holding Power):

The AVT (average viewing time) and HPr were that "Web" was 27 seconds and 3.2%; "Bulldozer was 24 seconds and 2.9%; "Films" were 23 seconds and 2.7%; "The Leaf Factory" was 20 seconds and 2.4%; and lastly "Ecosystems" was 8 seconds and 1.0%. The HPr of "Ecosystems" (1%) which was the lowest data was close to the result of the pilot study (1.3%) (see Fig 6.3 below).

<table>
<thead>
<tr>
<th>SECTION</th>
<th>AP(%)</th>
<th>AVT (AVERAGE VIEWING TIME) (SEC)</th>
<th>HPr(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(RANGE) (MEDIAN) (MEAN)</td>
<td>(MEAN/VLS)</td>
</tr>
<tr>
<td>ECOSYSTEMS</td>
<td>35</td>
<td>25(5-30) 5 8</td>
<td>1.0</td>
</tr>
<tr>
<td>LEAF FACTORY</td>
<td>42</td>
<td>130(5-135) 10 20</td>
<td>2.4</td>
</tr>
<tr>
<td>WEB</td>
<td>27</td>
<td>170(5-175) 20 27</td>
<td>3.2</td>
</tr>
<tr>
<td>BULLDOZER</td>
<td>37</td>
<td>70(5-75) 23 24</td>
<td>2.9</td>
</tr>
<tr>
<td>FILMS</td>
<td>15</td>
<td>75(5-80) 15 23</td>
<td>2.7</td>
</tr>
</tbody>
</table>
DISCUSSION

The exhibits measured AP and HPr are all of similar size in order to compare the results. Some important results are discussed below.

1. The AP (Attracting Power) of the "Ecosystems" section in the chasm were 35%. It was not so small percentage comparing others. However, the AVT (Average Viewing Time) was the lowest that is 8 seconds and HPr (Rating Holding Power) was 1.0%. Hence most visitors glanced at the exhibit. In other words, they might not have been interested in spending time to peep into the African savanna from the slits on the frosted grass wall.

2. The AP of the "Films" section, which show human impacts on the environment near the exit without chairs, is 15% and it was the lowest among them. The results showed that most visitors were not interested in stopping to view the section. The AVT was 23 seconds and it was not too short time comparing others. However if visitors wanted to watch the films, it would take about 1'10" a film and total 5'50". Hence most visitors did not watch one film completely. From these results, it can be said that this section might not be popular among most visitors.

3. The "Bulldozer" section in the chunk on "human impacts" using moving factor (see p103) was relatively high AP that is 37% in spite of unclear films on the shovel-like screen (see p280). Perhaps, the moving factor (a full-scale shovel of a bulldozer was moving back and forth) attracts visitors.

In addition to these, the case of the "Reactivity" has been found, which means that "situation in which some aspect of the procedure in a study influences the person under study, for example, people view exhibits longer if they know they are being observed in a study" (Center for Social Design, 1988:9). In the
study of solitary visitors' behaviour, when this researcher stood very near the exhibit of "The Leaf Factory", only one visitor (female in her forties) viewed it out of 15 visitors (AP=6.6%), but when the researcher changed his position which was away from his previous position, 6 visitors out of 15 stopped to view it (AP=40%). However during this test, groups' behaviour have not been noticeably changed. This result is contrary to the example which is mentioned above. Hence further study on "reactivity" needs to be conducted.

(C) GENERAL OBSERVATION (GO)

VLS (Visitors' length of stay), AP (Attracting Power) and HPr (Rating Holding Power) have been quantitative analyses, however this section "General Observation" (GO) is more qualitative, that is to observe visitors' behaviour as unobtrusively as possible, and to deduce their attitude towards the Exhibition. This should add more and different information on visitors' behaviour and thereby enhance the whole observation study (Note: throughout this study, the definition of children is up to approximately 15 years old, and adult is approximately over 15 years old).

a) PILOT STUDY

METHOD

Pilot study was undertaken on 21 (Sun) November, 1993. The visitor density was "fairly crowded". The sections which were measured AP and HPr were: "Ecosystems" (for introduction, in the chasm); "The Leaf Factory" (photosynthesis); and "Films" (human impacts on ecosystems). Those who stopped to view included all age groups except school groups. The observation time for each section was 15 minutes. This is a limited time for this researcher to concentrate on observing visitors' behaviour accurately (Note: in the Main study, if observing each
section for 15 minutes, at least 5 hours will be spent: $15' \times 19$ selected sections $= 285' = 4^0 45'$. The results were as follows.

**RESULTS**

**Ecosystems** (see photo B, p253)
This section consists of two: (a) stuffed animals and (b) African grassland. Most visitors peeped (a) stuffed animals first, and then, less visitors peeped (b). According to quantitative observation, one of the reasons might be that the height of slits above the floor on the frosted glass wall for peeping do not suit some visitors, and the width of the slits is not enough to view the whole diorama without considerable effort. However, many children were interested in peeping, and some large groups (more than 5 people) stopped to peep, since as soon as one looked, the others followed.

**The Leaf Factory** (see photo H, p257)
A model of sunflower with text shows the outline of photosynthesis which is installed in front of "The Leaf Factory". The majority of visitors read the text carefully, and then just passed through "The Leaf Factory". However, some leaders of groups such as fathers of families explained the subject to the others.

**FILMS** (see photo R, p264)
The watching time of the films varied but the majority of visitors watched for a very short time often with just a glance. In particularly, many children were more interested in viewing and stamping on the colourful floor lamps which are for decoration on the floor.

b) MAIN STUDY
METHOD

The main study was undertaken on 4 (Sat) and 5 (Sun) December, 1993. The visitor density was "fairly crowded". Each section (19) was observed for 15 minutes each. Otherwise the methods were the same as for the pilot study. However, in this study, especially, the difference between children (up to 15) and adults (15+) in terms of their behaviour was examined. The children's behaviour was not examined in the other studies on VLS (Visitors' Length of Stay in the gallery), AP & HPe, questionnaire and interview. In addition, some groups' behaviour were examined if this researcher could recognise visitors as groups, since once they entered the Exhibition, very often they separated each other or mixed with others.

RESULTS

[A] THE RAINFOREST (see p252)

This section was very popular with both children and adults. Some of them said "Look rainforest!" or "Jungle!", and took a photograph. They also enjoyed resting on the artificial log-like benches. Some visitors looked down on the glass floor showed some small figures of animals changing colours which was installed near the entrance of the "Rainforest".

[B] EARTH SCIENCE (see p253)

This consists of some smaller quadroscopes. Among them, "The Atmosphere" was the most popular for both children and adults. It shows the dynamic clouds of the earth. And "The biosphere" was the least popular which showed some living organisms. Some adults read words by famous people in terms of ecology on the glass wall, but most visitors looked into the quadroscopes only briefly.

[C] ECOSYSTEMS (see p254)

Many children were interested in peeping to see the stuffed animals and African
grassland. However, adults were not so interested in doing so, as the same as the result of the pilot study, rather they, especially middle aged men, watched TV monitors which showed the animals' life in the grassland. Some visitors adjusted their height to peep into the exhibit through the slits on the glass wall.

[D] THE WATER CYCLE (see p254)
This was the most popular exhibit in the Ecology Exhibition for both children and adults. Everybody stopped to watch for a certain time. Some visitors were not only interested in watching the huge quadroscope, but looked around it, even looked down on the bottom of it, because it was reflected by the mirrors which surrounded the quadroscope. Consequently this section was very often crowded.

[E] OCEANS (see p255)
Generally, both adults and children picked up handsets to listen, and then just glanced at the other panels. In particular, few visitors read the electronic information panels which were installed at a far higher level than eye level. However some middle-aged men read the information panels carefully.

[F] LAND (see p255)
Many visitors, both adults and children, were interested in touch screens, but few visitors viewed the slides on the stonehenge-like screen. Some of them concentrated on watching the touch screens including children around 12 year olds and elderly persons.

[G] ENERGY AND SUNLIGHT (see p256)
Most visitors, adults and children were interested in a melon-like earth, and then, went through the exhibit's corridor briefly glancing and scanning the other exhibits. Some children enjoyed sliding a carriage to highlight the text
of the effect of sunlight, arguably because this is like their own toys.

[II] THE LEAF FACTORY (see p257)
Many adults read the text on the box of a model of sunflower which shows an introduction of photosynthesis, and then they went through or stayed briefly in "The Leaf Factory" as the same as the result of the pilot study. Children were quite interested in staying in this section and some of them touched the model of a leaf's organs. However, some leaders of groups such as fathers described and explained this section to the rest of their groups.

[I] FEEDING (p258)
Nearly everybody seemed to enjoy seeing an artificial hedge and a topiary in the shape of a rabbit, which are installed in front of the exhibit for decoration. Many visitors especially children touched the topiary. Then they went directly to the stuffed tiger eating a deer not viewing other species exhibited.

[II] THE CHAIN, THE WEB & THE PYRAMID (see p259)
Most visitors first see "The Chain" and then went directly to "The Pyramid" not viewing "The Web". Generally, adults tended to be interested in "The Chain" more than children. Visitors in front of "The Pyramid" picked up handsets to listen to the information.

[X] NUTRIENT CYCLES - A RABBIT'S LIFE (p260)
Nearly half of visitors stopped at this section briefly and others studied carefully. The latter were usually over 30 years old or family groups. Some children were quite interested in this section. When a narrator said "rabbit died", a small girl said to her mother "Mum, a rabbit died" and took her mother to the exhibit, for example. This section seemed to be moderately popular among
visitors.

[N] NUTRIENT CYCLES - COMPUTER (see p260)
Many children operated the computer. Some fathers of families showed how to operate it. When someone was using the computer, some visitors watched it from behind, and after that they started to operate it for themselves. In one example, 3 families (altogether 10 visitors) operated it in turn.

[M] POPULATION BALANCE (see p261)
This section seemed to be not so popular with either adults or children. Many families stayed for only a brief time. However, some young adults of around 20 years in age studied carefully this balance through the stuffed rabbits exhibit. For example, a teenage couple watched the balance and read the information carefully; 2 teenage females were interested in watching the moving balance; a male in his twenties looked it at carefully and similarly a female in her twenties read the electronic information panels carefully.

[N] ENVIRONMENTAL CHANGES (see p261)
A majority of visitors were interested in this section. Some families enjoyed looking at the rising box showing some species. And also some leaders of groups such as fathers described the concept to others. Again, young adults of around 20 in age, concentrated on watching the boxes and videos, and reading the text.

[O] THE BARN COMMUNITY (see p262)
This section was very popular for all kinds of visitors, so sometimes it was very crowded. Some parents described the concept to their children. For example, one mother said "Look!" to her daughter and took her to the exhibit. Most visitors just looked into a diorama of a barn with some stuffed animals pressing button switches on the console panels to spotlight the object, and they
were not so interested in reading the text. Some children pressed the button switches just for fun.

[P] HOW ECOSYSTEMS GROW (see p263)
First, many visitors both adults and children saw the first exhibit, the diorama of flowing lava from a volcano, and then walked slowly to the end of the exhibit, which was the group of arrow-shaped panels described some human impacts on ecosystems. Most visitors did not read the 3 panel-exhibits with quite small letters which were installed in the middle part of this section.

[Q] HUMAN IMPACTS(1) - BULLDOZER (see p264)
This section seemed to be moderately interesting for both adults and children. Amongst visitors who watched the exhibit, some females in their twenties enjoyed the exhibit. For example, 2 females in their twenties watched the moving shovel of the bulldozer and talked to each other about it for a while. Also 2 teenage girls watched it and called another friend over to see it.

[R] HUMAN IMPACTS(2) - FILMS (see p264)
Children seemed particularly interested in the film describing a TV game using animations played by a child actor and a child actress. Hence the families with children watched the film for a certain time. Sometimes children watched it alone, and afterwards their families come back to them. Also many children enjoyed stamping colourful floor lamps which were for decoration on the floor, as showed in the pilot study.

[S] HUMAN IMPACTS(3) - GREENMAN (see p265)
Many visitors looked at the statue of the "Greenman" with plants and animals decorating his body which symbolized human beings cynically. However most visitors were not so interested in pressing the buttons on the console panel and
DISCUSSION

The results of the pilot study and the main study were very similar to each other. Through the observation study, most visitors both adults and children seemed to be moderately interested in viewing the whole Exhibition. However, some sections were very popular among them which were "The Rainforest"; "The Water Cycle"; and "The barn Community". All these exhibits have highly affective effects (1) on visitors using AV effects and some affective factors. For example, "The rainforest" gives visitors an experience of walking on a short path through the forest hearing some sounds of a waterfall and animals' calls. "The Water Cycle" is the biggest quadroscope in the world with 20 video screens showing the film of the sequence of the water cycle. And "The Barn Community" describes a diorama of a barn using some stuffed animals, sound effects of the animals' calls and smells of the true barn.

On the other hand, the section "How Ecosystems Grow" was the least enjoyed by visitors, because this exhibit does not use any affective effects as above mentioned, and to make matters worse, the panels are beyond the guard rails using small letters on the panels, some of which cannot be read properly.

In addition, these results were divided into three: "P" (positively viewed by visitors); "M" (moderately); and "N" (negatively), which were roughly estimated by this author as follows.

(1) Affective effect and cognitive effect: "Affective effects" are the extent of feeling reactions of pleasantness-unpleasantness felt by a person as a result of experiencing an exhibition. Giving some educational information from an exhibition is entitled "cognitive effects" as interpreted by this author.
ESTIMATION OF VISITORS' ATTITUDES TOWARDS VIEWING THE EXHIBITION

BY OBSERVATION STUDY IN THE ECOLOGY EXHIBITION, THE NIM

NOTE  P:POSITIVELY VIEWED; M:MODERATELY VIEWED; N:NEGATIVELY VIEWED

J. H. IGUCHI 1993

<table>
<thead>
<tr>
<th>No</th>
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<th>ADULTS</th>
</tr>
</thead>
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<tr>
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<td></td>
<td>P P</td>
<td>P P</td>
</tr>
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<td>M</td>
</tr>
<tr>
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<td>VIDEO PEEPING</td>
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<td></td>
<td></td>
<td>N P</td>
<td>M N</td>
</tr>
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<td>P</td>
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<td></td>
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<td>M N</td>
</tr>
<tr>
<td>F</td>
<td>LAND</td>
<td>TOUCH SCR EE.SLIDES</td>
<td>TOUCH SCR EE.SLIDES</td>
</tr>
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<td></td>
<td></td>
<td>P N</td>
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</tr>
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<td>G</td>
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<td>MELON OTHERS</td>
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<td>P M</td>
<td>P M</td>
</tr>
<tr>
<td>H</td>
<td>THE LEAF FACTORY</td>
<td>SUNFLOWER ORGANS</td>
<td>SUNFLOWER ORGANS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M M</td>
<td>P M</td>
</tr>
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<td>ADULTS</td>
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<td>----</td>
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<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>I</td>
<td>FEEDING</td>
<td>TOPIARY</td>
<td>TOPIARY</td>
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<tr>
<td></td>
<td></td>
<td>TIGER P</td>
<td>TIGER P</td>
</tr>
<tr>
<td>J</td>
<td>THE CHAIN, THE WEB &amp; THE PYRAMID</td>
<td>CHAIN WEB</td>
<td>CHAIN WEB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PYRAMID M</td>
<td>PYRAMID M</td>
</tr>
<tr>
<td>K</td>
<td>NUTRIENT CYCLES: A RABBIT'S LIFE</td>
<td>P</td>
<td>M</td>
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<tr>
<td>L</td>
<td>NUTRIENT CYCLES: COMPUTER</td>
<td>M</td>
<td>M</td>
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<td>M</td>
<td>POPULATION BALANCE</td>
<td>M</td>
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<tr>
<td>N</td>
<td>ENVIRONMENTAL CHANGES</td>
<td>M</td>
<td>P</td>
</tr>
<tr>
<td>O</td>
<td>THE BARN COMMUNITY</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>P</td>
<td>HOW ECOSYSTEMS GROWS</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Q</td>
<td>HUMAN IMPACTS(1): BULLDOZER</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>R</td>
<td>HUMAN IMPACTS(2): FILMS</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>S</td>
<td>HUMAN IMPACTS(3): GREENMAN</td>
<td>GREENMAN</td>
<td>GREENMAN</td>
</tr>
<tr>
<td></td>
<td>PANELS</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
In order to ascertain visitors' opinions of the Ecology Exhibition and their awareness of environmental issues, closed-ended questions (see p144) by questionnaire were conducted. This questionnaire was designed to obtain that data quickly with the minimum of pressure on visitors. Some questionnaires ask visitors too many questions with complex structures. Although those questionnaires seem satisfactory, the visitors may find filling them in difficult. As a result, the reliability of the results might not be assured because visitors may have to finish such questionnaires quickly without thinking the answers through carefully. To avoid this problem, most questions in this questionnaire used simple methods of "rating" (semantic differential) and "category" (see pp144,145). It includes questions for "psychological analysis" that is to examine cognitive and affective effects; and for "sociological analysis" including the reasons for the motivation of visit and visitors' academic careers, which will be discussed in the next chapter.

The outline of the method of sampling and the manner of access to the visitors were described in chapter 4 (see pp206,207), and a gallery questionnaire and the one filled in by a respondent are inserted in Appendices 15 and 16. In addition some comments about the questionnaire are as follows.

1. "What age is this exhibit best suited for?" was asked explaining to visitors that is: for children only is "1"; for adults only is "5"; and for both is "3".

2. "Seeing photos of sections of the Ecology Exhibition, please answer the following questions: a) Which section did you like best? b) Which section did you like least? This question was asked using photos to reduce efforts visitors had to make, which are shown in figure 11 (see pp252-265). In the
figure 11, the shapes and sizes of some photos are shown, but photos used for the questionnaire were only one per section and that was the largest rectangular picture to avoid bias between different sizes and shapes of photos. The number of the answer expected in each case was only one, but plural answers were accepted (for example, "A" and "B").

3. "If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it?" (for "sociological analysis") is a hypothetical and leading question which has been inserted intentionally. This will be discussed in Chapter 7.

(A) PILOT STUDY

METHOD

The pilot study was completed on 17 (FRI) December in 1993, when visitor density was "fairly crowded". 8 visitors, who were about to leave, agreed to answer the questionnaire and to be interviewed. The method of sampling was a "randomly stratified sampling" (see p142), that is, in principle, the numbers sampled were balanced in terms of age and sex for solitary visitors; and families and other groups for group visitors, to avoid the bias of the results. Once this work starts, it had to be continued unless the researcher had to take a break for whatever reason or in extreme conditions such as too many school children, in order to avoid selecting samples of the researcher's preference. The visitors chosen and who were prepared to answer were then asked to enter a relatively quiet and sheltered room near the Exhibition. Then after filling in the questionnaire, they were asked if they were prepared to be given a short interview. These results are as follows.

RESULTS AND DISCUSSION (PILOT)
**AFFECTIVE EFFECTS:**

- The "most enjoyed" sections was "The Water Cycle" (D: photo's number - see pp252-265) in the case of 2 persons, and the "least enjoyed" section was "The Chain, the Web and the Pyramid" (J) in the case of 2 persons as well, and other sections were widely selected by each one person. Hence in the main study, the results might not show great differences between the most enjoyed and the least enjoyed sections.
- Most respondents felt this Exhibition was "very" or "quite" stimulating.

**COGNITIVE EFFECTS:**

- Visitors' mental maps, which mean that how to find their way around themselves to go to the next section, was "clear" for 100% of those sampled.
- Labels used were "quite easy" to understand; amount of information was "more or less" or "many".
- About spoken words, 3 persons chose "more or less" and 4 persons answered "very clear". Thus the answers were diverse. Hence, in the main study, this point will be focused upon.
- The comprehensive level of the Exhibition was relatively satisfactory for both children and adults.
- It was asked if the section "Human impacts on the environment" was effective, and 3 persons answered "more or less", whereas others were diverse responses. This point will also be focused upon in the main study.

As a final comment, this job was very time-consuming. Hence endurance is needed if 100 questionnaires and interviews are to be completed by one researcher.

**(B) MAIN STUDY**

a) METHOD
The main study was conducted from 18 December 1993 to 10 February 1994 for 9
days including weekends. Visitor density for about 50% of those times was
"fairy crowded", 30% was "very crowded" and 20% was "less crowded". The number
sampled was 50 solitary visitors and 50 groups.

50 solitary visitors were 30 males and 20 females due to less number of females
than males visiting the Ecology Exhibition. The ratio of the number sampled in
terms of age groups was that (1) teens were 16%; (2) 21 to 30 were 32%; (3) 31
to 60 were 32%; and (4) over 60 were 16% (owing to less number of older visitors
- over 30 year olds).

50 groups were 30 families and 20 friendship groups, again due to less
friendship groups than family groups. The number of the family groups was
balanced in terms of the range of categories that is "father with a son";
"father with a daughter"; "mother with a son"; "mother with a daughter"; and
other groups. Similarly, the number of the friendship groups was also balanced
that is "2 males"; "2 females"; "a man and a woman"; and "other groups".

In addition, the percentage of acceptance for filling in questionnaires was 72%,
and for interviews, asked after filling the questionnaire, was 100%. Other
methods have already been described earlier under the pilot study. The results
and discussion for these are as follows.

b) RESULTS AND DISCUSSION

1. AFFECTIVE EFFECTS

THE MOST AND LEAST ENJOYED SECTIONS:
Neither the "most enjoyed" sections nor the "least enjoyed" sections were prominent. The results were widely spread.

The "most enjoyed" section was (D) "The Water Cycle" selected by 23% of respondents which the section shows this subject matter using a huge quadroscope. This section was quite noteworthy in the results. The second was (A) "The Rainforest" (13%), (a diorama using artificial plants); and the third was (H) "The Leaf Factory" (8%), (a diorama of enlarged organs of a leaf); (I) "Feeding" (8%), (a diorama using stuffed animals); and (O) "The Barn Community" (8%), (a reconstructed barn including stuffed animals). Other answers varied from 7% to 1%.

As far as the "least enjoyed" sections are concerned, no clearcut answers were given and the answers were widely spread. The "least enjoyed" section however was (H) "The Leaf Factory" selected by 11% of visitors sampled, and that section was also selected as the third "most enjoyed" section by other respondents; the second was (J) "The Chain, the Web & the Pyramid" (10%) (electronic information panel and handsets to listen to the information); and the third was (B) "Earth Science" (9%) (some smaller quadroscopes peeped from slits on the frosted glass wall), which was also selected by 7% of the respondents for the "most enjoyed" section.

In addition, 20% of visitors sampled answered no "least enjoyed" section. These results are shown graphically in figures 6.5 and 6.6 below.
### The Most Enjoyed Sections by Visitors in the Ecology Exhibition, The NHM

**J. H. Iguchi 1993**

<table>
<thead>
<tr>
<th>SECTION</th>
<th>D</th>
<th>A</th>
<th>H</th>
<th>I</th>
<th>O</th>
<th>B</th>
<th>K</th>
<th>E</th>
<th>F</th>
<th>ETC.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS (%)</td>
<td>23</td>
<td>13</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>16</td>
<td>100</td>
</tr>
</tbody>
</table>

**Diagram: Fig 6.5**

- The Water Cycle
- The Rainforest
- The Leaf Factory
- The Bank Community
- Earth Science
- A Rabbit's Life
- Ocean
- Land

The percentages are shown for each section, with the total adding up to 100%.

---

*Note: The table above lists the percentages for each section, and the bar graph visually represents these percentages.*
### The Least Enjoyed Sections by Visitors

In the Ecology Exhibition, The NIM

![Fig 6.6](image)

<table>
<thead>
<tr>
<th>SECTIONS</th>
<th>H</th>
<th>J</th>
<th>B</th>
<th>Q</th>
<th>S</th>
<th>C</th>
<th>I</th>
<th>A</th>
<th>R</th>
<th>ETC.</th>
<th>NO</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>14</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

J. H. Iguchi 1993

---

- **Fig 6.6**: Bar chart showing the least enjoyed sections by visitors in the Ecology Exhibition. The sections include The Lean Factory, The Ship, The Web, The Pyramid, Earth Science, Human Impact 1, Human Impact 2, Green Man, Feeding, Human Impact 3, and others. The chart displays the percentage of visitors who found each section least enjoyable, with the total responses being 100.

---

- **Table**: Table showing the answers in percentages for each section. The sections are listed alphabetically with their corresponding percentages. The total number of responses is 100.

---

- **Graph**: Bar chart with sections listed on the x-axis and percentages on the y-axis. Each bar represents the percentage of visitors who disliked each section, with the total number of responses being 100.
AFFECTIVE EFFECTS OF THE ECOLOGY EXHIBITION:

In order to assess affective effects of the Ecology Exhibition, the questionnaire asked respondents if they felt the Exhibition was stimulating or boring using a rating scale from 1 to 5. Most of them (82%) answered 1 or 2 that was "stimulating" or "quite stimulating". The mode was 2, and the mean was 1.8. Then the number of answers decreased greatly towards "4", and nobody selected "5" that was "boring". The distribution of the data is skewed to the left. Figure 6.8 shows the results below.

<table>
<thead>
<tr>
<th>SCALE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>MODE</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>39</td>
<td>43</td>
<td>15</td>
<td>3</td>
<td>0</td>
<td>1.8</td>
<td></td>
</tr>
</tbody>
</table>

Fig 6.7

J. H. IGUCHI 1993

SEMANTIC DIFFERENTIAL SCALE
DISCUSSION

Firstly, in terms of the sections with most impact on visitors' feelings, there was no section enjoyed by a majority of those sampled. However (D) "The water cycle" was chosen by nearly one quarter of respondents, and it might be said to be a success. Through study of "physical analysis" in chapter 5, and "general observation", this section is the most successful exhibit in this Exhibition, and therefore the study of AP (attracting power) and HPr (Rating Holding Power) were in this case not taken into account. And other sections were enjoyed by various visitors widely depending upon visitors' taste. Within these, (C) "Ecosystems" which was peeped through the slits on the frosted glass, was chosen by only 2 persons (1.8%), which the HPr was the lowest within 5 sections selected (see Fig 6.3, p285). Also no respondents chose (R) "Films", describing human impacts on the environment which the AP was the lowest within 5 selected sections (see Fig 6.3). From these data, the results of the questionnaire are close to those of AP and HPr.

Secondly, the "least enjoyed" section "The Leaf Factory" was chosen by only 11% of those sampled, and it was also chosen by 8% for the "most enjoyed" section. On the other hand, 10% of respondents said that "The chain, the Web and the Pyramid" was the "least enjoyed" which no respondents chose for the "most enjoyed". However, 20% of them felt that there was no "least enjoyed" section at all. Also, owing to no previous similar study done by other researchers, these results cannot be compared with other results (Note: in summative evaluation conducted by other researcher in 1991, the study of the most and least enjoyed exhibits mixed up with other aspects. See p186,187).

Thirdly, in terms of the affective effects of the exhibition, around 80% of those sampled said that it was "stimulating" or "quite stimulating". From these data, it can be deduced that the Ecology Exhibition is relatively
successful in terms of the affective domain.

2. COGNITIVE EFFECTS

VISITORS MENTAL MAPS:
The sequence of this Exhibition is one way system and there is no island exhibit, which can be seen from all angles. Under these circumstances, however, the question "How to find your way around" was asked using a rating scale, from "1" which represented "clear" to "5" which was "confusing". The results were that 84% of those sampled said "clear" or "quite clear", and the mode was "1" (clear); and the mean was 1.5. However, 13% felt "more or less". The distribution of the data is skewed toward "clear". The results are shown in figure 6.8 below.

VISITORS' MENTAL MAPS IN THE ECOLOGY EXHIBITION, THE NUM

<table>
<thead>
<tr>
<th>SCALE</th>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>MODE</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>72</td>
<td>12</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>MEAN</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Fig 6.8
J. H. IGUCHI 1993

1: Clear
5: Confusing

SEMANTIC DIFFERENTIAL SCALE
ASSESSMENT OF THE TEXTS:

1) CONTENTS OF THE TEXTS

This question "Label used" asked about the contents of the texts in the labels and panels. The purpose of this question is to know how those sampled understood the texts used in the Exhibition. The question was used a rating scale from "1" which represented "easy" to "5" which was "hard". The results showed that 95% of those sampled felt the texts were "easy" or "quite easy" to understand, and no one sampled said "quite hard" or "hard". The mode was "1" (easy), and the mean was "1.4". The mode "1" was prominent, and then, the number of the answers decreased towards "3". The results are shown in figure 6.9 below.

<table>
<thead>
<tr>
<th>SCALE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>MODE</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>70</td>
<td>25</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>MEAN</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Fig 6.9

J. H. IGUCHI 1993
Visitors were asked about the amount of information through the Exhibition using a rating scale from "1" which represented "few" to "5" which was "many". The results were that most of those sampled felt "many" or "more or less", and the mode was "4" and the mean was "3.7". Hence, the distribution of the data is skewed towards the "many" pole. However 14% of those sampled thought that the amount of information was not enough (1 & 2). The results are shown in figure 6.10 below.

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<tr>
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<th>5</th>
<th>MODE</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>3</td>
<td>11</td>
<td>27</td>
<td>34</td>
<td>25</td>
<td>MEAN</td>
<td>3.7</td>
</tr>
</tbody>
</table>

![AMOUNT OF INFORMATION FOR VISITORS IN THE ECOLOGY EXHIBITION, THE NUM](image)
3) SPOKEN WORDS

Spoken words such as narrative information through speakers and handsets are frequently used in the Exhibition, therefore, their contents and clarity must be studied. This question to do with "spoken words" was asked using a rating scale from "1" which represented "clear" to "5" which was "confusing". Although about half of those sampled answered "clear", the distribution of the answers spread widely towards "5" (confusing), with 13% of the responses which were "quite confusing". The mode was "1" (clear) and the mean was "1.9". The results are shown in figure 6.11 below.

**SPOKEN WORDS FOR VISITORS**

**IN THE ECOLOGY EXHIBITION, THE NIM**

<table>
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<tr>
<th>SCALE</th>
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<th>4</th>
<th>5</th>
<th>MODE</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>52</td>
<td>19</td>
<td>15</td>
<td>13</td>
<td>1</td>
<td>MEAN</td>
<td>1.9</td>
</tr>
</tbody>
</table>

1: Clear
5: Confusing

**SEMANTIC DIFFERENTIAL SCALE**

1: Clear
2
3
4
5: Confusing
UNDERSTANDING LEVEL OF THE ECOLOGY EXHIBITION:

This question asked for what age this Exhibition was best suited. The prompt said that the rating scale "1" was for children only (Note: the term "children" was defined under 15-year olds in this study by this researcher); "3" was for both children and adults; and "5" was for adults only. Although the text used in the Exhibition (e.g. labels and panels) was written for over 15-year olds, this question asked about the whole design of the Exhibition. The results were that nearly 70% of respondents felt that the Exhibition was for both children and adults. The mode was "3" (for both children and adults), and the mean was "2.9", and the distribution of the data was therefore normal. The results are shown in figure 6.12 below.

<table>
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<th>5</th>
<th>MODE</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>2</td>
<td>16</td>
<td>69</td>
<td>12</td>
<td>1</td>
<td>MEAN</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Fig 6.12

J. H. IGUCHI 1993

SEMANTIC DIFFERENTIAL SCALE

1: Children
5: Adults

Children 1 2 3 4 5 Adults

-320-
EFFECTIVENESS OF THE SECTION "HUMAN IMPACTS ON THE ENVIRONMENT":

This question asked if respondents felt that the section of "Human Impacts on the environment" was effective using a rating scale from "1" which represented "no" to "5" which was "very effective". Although, 59% of those sampled felt the section was "quite" or "very" effective, 29% chose "more or less", and 11% chose "a little". The mode was "4" and the mean was "3.7". The distribution of the data was skewed to the "very effective" pole. The results are shown in figure 6.13 below.

**Fig 6.13**

**EFFECTIVENESS OF THE SECTION "HUMAN IMPACTS ON THE ENVIRONMENT" IN THE ECOLOGY EXHIBITION, THE NIM**

<table>
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<th>4</th>
<th>5</th>
<th>MODE</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSWERS(%)</td>
<td>1</td>
<td>11</td>
<td>29</td>
<td>39</td>
<td>20</td>
<td>MEAN</td>
<td>3.7</td>
</tr>
</tbody>
</table>

1: No  
2: A little  
3: More or less  
4: Quite effective  
5: Very effective  

*SEMANTIC DIFFERENTIAL SCALE*
DISCUSSION

From the results of questionnaires in terms of cognitive effects, a good deal of evidence has been obtained. The following is based on this evidence.

VISITORS' MENTAL MAPS:
The route of this exhibition is a clearcut one way system. In the pilot study, all those sampled (8) said "clear", however, in the main study, 25% of those sampled responded from "quite clear" to "more or less". Although it was a one way system and routes were clearly showed using arrow signs, unexpectedly not a 100% of those sampled felt "clear". It suggests that to show clearly the route of any exhibitions is vitally important to avoid visitors' losing their way around.

AMOUNT OF INFORMATION:
Although 59% of those sampled felt that the amount of information was from "many" to "quite many", 27% of them thought it was "more or less", and 14% answered from "few" to "quite few". It might be said that about 40% of those sampled wanted some more information. As a matter of fact, this Exhibition was designed as an introduction to ecology and affective outcomes were more expected. However visitors to the Exhibition included persons who wanted to study more than other visitors. Unexpectedly, 54% of those sampled have a first degree or more (Note: this matter will analyse minutely in chapter 7). However the mode: "4" (quite many) might show that the Exhibition generally suites the public including graduates.

SPoken WORDS:
Assessment of the spoken words showed that 28% of those sampled said that the clarity of the spoken words was from "more or less" to "quite confusing". The results of the pilot study were also widely spread. According to the "physical
analysis" undertaken by this researcher, spoken words such as narration through speakers or handsets were quite clear. However in only one section that is "The Leaf Factory", one of the eye-catching elements, the narrator's voice was husky and had a strong dialect (see p279). The reasons for visitors being dissatisfied with the spoken words are uncertain, but it might be said that the spoken words should be made as clear as possible in terms of both content and pronunciation.

ABOUT THE SECTION "HUMAN IMPACTS ON ECOSYSTEMS"

This section is the main focus of this research in terms of both the "physical analysis" and the "psychological analysis". Ecology concerns living organisms and their physical environment, and also involves human impacts on ecosystems. However, recently the term "ecology" has frequently implied human impacts on the environment and the related the "green" movement which have a strong impact on politics. It probably will depend on human action as to whether "climax communities" ("plant communities which has been stable for many years and which is unlikely to change unless the climate changes or there is human interference" (Collin P.H.1992:43) exist in the future. The importance and significance of all this needs to be acknowledged by all museums, and therefore this is an important section of the Exhibition for this thesis.

The results of the data of the effectiveness of this section however are widely spread with 40% of those sampled answering from "more or less" to "a little". The pilot study also showed similar results. From all previous studies about this section in this research, such as the "physical analysis", AP/HPr (Attracting Power/Rating Holding Power) and GO (General Observation), it might be argued that this section should be made more effective.
In order to ascertain visitors' opinions of the Ecology Exhibition, interviews in the Gallery were conducted. These face to face interviews were indispensable in supplementing the data obtained through questionnaires. At the same time, apart from discussion about the Exhibition, some general questions in terms of environmental issues were asked and this data will be analysed in the next chapter entitled "Sociological Analysis".

METHOD

The interviews were conducted with 100 visitors randomly sampled. The method of sampling and date were exactly the same as the "Questionnaire" survey, because the respondents were the same persons. The dates when they were conducted were from 17 December 1993 to 10 February 1994, and profiles of the visitors sampled were balanced in terms of sex and ages. Other detailed contents of the method were described in the previous section "QUESTIONNAIRE".

The questions for the gallery interviews (4 in total) and their aims are now shown.

1. Did you find any parts of this Exhibition particularly interesting?

   AIM: To supplement the results of the "questionnaire" and to obtain a range of diverse answers.

2. What do you think is the basic message of this Exhibition?

   AIM: To ascertain the message perceived by a visitor which might differ from the expectations of the exhibition planners.

   THE BASIC MESSAGE (summarized by this researcher consulting the "Exhibition objectives" - see p183)

   To introduce ecology and indicate that an understanding of ecological process is essential for assessing human impacts on the natural world.
3. In your opinion, does this Exhibition need to be improved?

*AIH*: to ascertain visitors' overall evaluation of the Exhibition.

4. Is there anything else you would like to comment on about this exhibition?

*AIH*: To give them the chance of talking freely thereby to gain additional information.

(A) PILOT STUDY

The pilot study was completed on 17 December in 1993 when visitor density was "fairly crowded". 8 respondents who finished filling in the "questionnaire" were asked to continue the "interview" and 100% of them agreed. Other aspects of this method were discussed in the former section "questionnaire". The results and discussion are as follows.

RESULTS AND DISCUSSION (PILOT)

1. Particular interesting sections:

Firstly most respondents' answers were the same as those of "questionnaire", that is "the most enjoyed sections" such as "The Water Cycle" (see p312). Therefore, in the analysis of main study, those answers are neglected to avoid making similar analysis of the "Questionnaire". Secondly, some respondents answered "all interesting", but this answer should also be ignored because of its superficiality. However, other diverse answers are vital to analyse, such as "visual effects".

2. Basic message:

The answers can be divided into 4 categories such as: natural process of ecology; people's awareness of the environment; human impacts on the environment; and conservation. These answers covered the basic message by the Exhibition planners. According to the results of the "questionnaire",

-325-
the section "human impacts" was not altogether effective. Hence, this point must be examined in detail in the main study.

3. Need for improvement:
8 out of 9 responded "no", and only one respondent said "Yes, always (exhibitions) should be improved". In the main study, a majority of respondents might be satisfied with the Exhibition, but detailed information in terms of unsatisfactory answers must be noticed.

4. Additional comments:
3 out of 9 respondents suggested more stress on conservation; more emphasis on human impacts; and to be enjoyed by both adults and children. Therefore, in the main study, in particular, critical viewpoints will be analysed.

(b) MAIN STUDY

The main study was conducted from 18 December, 1993 to 10 February 1994 for 9 days, including weekends. 100 visitors sampled randomly were asked to be interviewed immediately after filling in the "questionnaire", and 100% of them accepted. Only one respondent refused to be tape-recorded but 99% of them willingly or reluctantly accepted. Other detailed contents of the method have been shown in previous section "[2] QUESTIONNAIRE" (see p310). The questions were made up of 4 categories, and the results were summarised 3 parts such as: 1. Particularly interesting parts of the Exhibition; 2. Basic message; 3. Need for improvement. All contents of interviews were transcribed from the recorded tapes and inserted in Appendix 17. Owing to some sound effects from the Exhibition, tannoy and visitors' unclear pronunciation, some parts of interviews were unintelligible, and also some comments were of little value because of visitors' apparent confusion. The results and discussion are as follows.

a) PARTICULARLY INTERESTING PARTS OF THE EXHIBITION
1. ABOUT SECTIONS OF THE EXHIBITION

As expected, the answers were almost the same as "the most enjoyed sections of the Exhibition in the questionnaire". Hence, in order to avoid similar analysis to the "questionnaire", these comments were not analysed again. However some comments for the most popular section, "The water cycle" which was answered by 15% of the respondents are quoted as follows.

(Note: (No.1... 100) is a respondent’s number which is shown in Appendix 18; each "Ed: up to 16", "Ed: up to 18", "Ed: 1st degree, "Ed: Higher degree" refers to the respondent’s educational background; middle age is from 31 to 60 years old and elderly is over 60, used in this thesis only. In addition, all these quotes are from original comments by respondents, hence these might include grammatically incorrect sentences and slang).

Some clear answers for "The Water Cycle":

* "The water circle from the technical point of view was very striking...."  
  (middle-aged British male with a male friend), (Ed: up to 18), (No. 40).

* "Well, it wasn't very new to me, but the earth and water was very effective, very beautiful" (Belgian female in her twenties with 2 children), (Ed: higher degree), (No. 94).

* "I thought the globe and water cycle.... It was good but this was breathtaking... very clever the way it was done.... This had the most impact...." (middle-aged British female), (Ed: up to 16), (No. 97).

2. OTHER DIVERSE ANSWERS

9% of respondents offered diverse answers which included "architectural point of view" (2%); "mirror effects" (3%); "A-V effects" (3%); and "informative exhibition" (1%). Some clear comments are quoted as follows.
*"They are all interesting...very clever use in a small space. The impact was good for young children" (middle-aged Singaporean male with 2 his children, a boy and a girl), (Ed: higher degree), (No.5).

*"The mirrors and televisions...made it very interesting...very impressionable" (British male in his late teens), (Ed: up to 18 and going to university), (No. 9).

*"One part where you were shown all the mirrors and you were looking at the .... This part was the best...very interesting...big impact" (middle-aged British male), (Ed: up to 16), (No.10).

*"I particularly enjoyed the very early part with mirrors. I thought they were very dramatic and arresting.... I thought that was absolutely outstanding" (elderly British female in her sixties), (Ed: Ist degree), (No.98).

Almost these comments are about "mirror effect" which is used in the section of "The water cycle" and "Earth Science" in the ground floor. Hence these sections might have had a visitors strong impact on visitors in terms of its affective effect.

b) BASIC MESSAGE IN THIS EXHIBITION

The basic message in this Exhibition given by the Exhibition planners were guessed by 94 respondents. The answers can be divided into five that is:

a. General information on ecology

b. Human impacts on the environment and awareness of the conservation

c. How to save the earth

d. The dying planet (pessimistic view)

e. No message is communicated.
a. General information on ecology:

21% of respondents thought that the basic message was "general information of ecology" like "water cycle" and "nitrogen cycles". And they did not think the message tried much to say about the "human impacts on the environment". Some clear answers are quoted below.

* "About the planet we live in...general information" (British male in his late teens with a female), (Ed: 1st degree), (No. 29).
* "Basic education for children who do not know anything about ecology and the environment and maybe some..." (Portuguese male in his twenties with a female), (Ed: 1st degree), (No. 49).
* "Try to get over to people what the earth is like" (middle-aged British male with a daughter), (Ed: up to 16), (No. 63).
* "I think it's to show people about the environment, the world, and people, and machinery, but basically the environment" (Elderly British male), (Ed: up to 18), (No. 73).
* "Just a general understanding of the world ecology" (middle-aged British male with his wife and a male child), (Ed: 1st degree), (No. 87).
* "When I went to see it, I was impressed the way it covers pretty much every aspect of cycles...nitrogen cycle, water cycle, everything that goes to making the earth and how it works but I thought that the section of the human impacts on the environment is not satisfactory.... A lot more could be done" (British male in his twenties), (Ed: up to 18), (No. 22).

b. Human impacts on the environment and awareness of the conservation:

Most respondents (73%) thought that the Exhibition tried to say not only general information but much more the "human impacts on the environment" and the importance of the "awareness of the conservation. The answers emphasized on some specific concepts such as "awareness of one world"; "human impacts on
the environment": "preserving the planet"; and "our responsibility for saving the planet". And characteristics of these answers seemed to be positive in terms of saving the planet. Some clear answers are quoted below.

*"You must be a part of it and if you destroy it you destroy yourself"  
(Singaporean male in his twenties), (Ed: 1st degree), (No. 35).

*"I guess it's to give people information about how things work ... different ecosystems, and how they work together, and how it's been changing over the years due to human impacts as well as changes in nature"  
(middle-aged American female with her baby), (Ed: higher degree), (No. 21).

*"If we don't wake up, we are going to destroy the world"  
(British male in his twenties with a male child), (Ed: up to 18), (No. 8).

*"That's if all don't start thinking about ecology, we won't have an earth left"  
(middle-aged South African male with a female), (Ed: Higher degree), (No. 26).

*"Made aware of local environment and global environment... how one reaction can spark another reaction... a growing awareness of how much damage it is doing as well"  
(British male in his late twenties), (Ed: 1st degree, studying environmental science), (No. 78).

*"The fact that we have to take care of our environment and that we have to preserve it"  
(middle-aged British female), (Ed: up to 18), (No. 53).

*"To get people more involved in conservation. We've only got one earth and we should look after it"  
(middle-aged South African female), (Ed: 1st degree), (No. 70).

*"I imagine is to say there is only one earth and we should look after it"  
(elderly British male in his sixties), (Ed: up to 18), (No. 100).

*"How the world and nature is balanced and how necessary it is, not for our own greed but for our own future"  
(middle-aged British-Jersey female), (Ed: up to 18), (No. 85).
"We are the only people that can make any difference. If we don't change it there will be nothing left. What we have is valuable and we should work very hard to ensure that we have still got and our children's children will have still got the rainforest. It is valuable and we should keep it" (elderly British female), (Ed:1st degree), (No.99).

c. How to save the planet:
Only 3% respondents thought that the Exhibition tried to say some ideas of how to save the planet. They might have remembered much more clearly the last section "Human Impacts" than the rest of sections. Some clear answers are quoted as follows.

*I think it tells you all about the environment and how to save it" (middle-aged British female with a daughter), (up to 16), (No.19).
*I "How to save the environment...how to keep it clean...what to eat...how we should change our lives..." (Israeli male in his twenties), (Ed:up to 18), (No.33).

d. The dying planet (pessimistic view):
Only 2% thought pessimistically that the message was "the dying planet". They might have thought that it was too late to save the earth. The answers are as follows.

*I "The destiny of the earth...that's the message" (middle-aged British female with her husband and a her child), (Ed:up to 16), (No.38).
*I "The dying planet.... Yes it will die" (middle-aged British male on crutches with his wife and his two female children), (Ed:up to 18), (No.7).

All these results are shown graphically in figure 6.14 as follows.
### Basic Message in the Ecology Exhibition Guessed by Visitors, the NHM

**J. H. IGUCHI 1994**

The table below shows the distribution of responses to different messages communicated at the exhibition:

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>20</td>
<td>68</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>94</td>
</tr>
<tr>
<td>%</td>
<td>21</td>
<td>74</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

- **a**: General information on ecology
- **b**: Human impacts on the environment and the awareness of the conservation
- **c**: How to save the planet
- **d**: The dying planet
- **e**: No message is communicated

**N**: The number of the respondents

---

**Human Impacts on the Environment and the Awareness of Conservation**

- **No message communicated**: 1%
- **The dying planet**: 2%
- **How to save the planet**: 3%
- **General information on ecology**: 73%

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c) **NEED FOR IMPROVEMENT**

98 respondents answered to this question and the results were that, as expected, 35% of answers was "It does not need to be improved", and 7% was "It’s OK", that is 42% of respondents felt the Exhibition was satisfactory. However over half of respondents wished it to be improved. Within their comments, 13% of respondents felt that the human impacts on the environment was not emphasized enough; 8% wished it to be more relevant for small children; 6% asked for an extension of the Exhibition area; and 5% said that generally always exhibitions should be improved. The results are shown in figure 6.15 below.

**NEED FOR IMPROVEMENT BY VISITORS' ASSESSMENT**

**IN THE ECOLOGY EXHIBITION, THE NHM**

(109 ANSWERS) J. H. IGUCHI 1994

<table>
<thead>
<tr>
<th>ANSWERS</th>
<th>NUMBER %</th>
<th>ANSWERS</th>
<th>NUMBER %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A NO NEED</td>
<td>(38) 35</td>
<td>H MORE EFFECTIVE</td>
<td>(3) 3</td>
</tr>
<tr>
<td>B STRESS ON HUMAN IMPACTS</td>
<td>(14) 13</td>
<td>I MORE INTERACTIVE</td>
<td>(2) 2</td>
</tr>
<tr>
<td>C FOR YOUNGER CHILDREN</td>
<td>(9) 8</td>
<td>J USE SOME LANGUAGES</td>
<td>(2) 2</td>
</tr>
<tr>
<td>D IT’S OK</td>
<td>(8) 7</td>
<td>K MORE INFORMATION</td>
<td>(2) 2</td>
</tr>
<tr>
<td>E TO BE EXTENDED</td>
<td>(7) 6</td>
<td>L ADVERTISE</td>
<td>(2) 2</td>
</tr>
<tr>
<td>F ALWAYS, SHOULD BE IMPROVED</td>
<td>(6) 5</td>
<td>M FREE ADMISSION</td>
<td>(2) 2</td>
</tr>
<tr>
<td>G DON'T KNOW</td>
<td>(3) 3</td>
<td>N OTHERS</td>
<td>(11) 10</td>
</tr>
</tbody>
</table>

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333
Some clear comments in terms of above the graph are quoted as follows.

*It does not need to be improved (A)*:

*"I think it is very high standard. Improved from 20 years ago...not a place you would bring children...now it's much better.... Lighting's good, atmosphere's good...100% improvement" (elderly British male), (Ed: up to 18), (No.14).

*"I was very surprised with the technology.... See these items" (Japanese female in her late teens with a Brazilian female and her 2 children), (Ed: 1st degree), (No.66).

*"This Exhibition does not need to be improved but it needs to be put it on many different places" (Moroccan male in his twenties with his daughter), (Ed: 1st degree), (No.83).
Stress on human impacts (B):

*"Last bit on human impacts and the environment, I did not find very clear" (British male in his twenties with his son), (Ed:up to 18), (No.1).

*"Yes...the human impacts. I think the Exhibition was visually excellent and easy to use.... All I could say for improvement would be to add more about human impacts and explain population balance" (British male in his twenties), (Ed:up to 18), (No.22).

*"...the Exhibition was very good, well thought out and organised, logically clear and very (good) used of audible aides and modern technology, and perhaps if the end (human impacts) could have a strong emphasis on what the individual could do...." (middle-aged Australian male with a baby), (Ed:1st degree), (No.32).

*"The only thing that could give more impact is the very last bit saying what we're doing...and how we're destroying it and there should be more impact (about) the forestry and sewage going back into the water...(these) points should be made stronger...just add a little more to it ...(for) these youngsters" (middle-aged British female), (Ed:up to 16), (No.97).

*I think one has had a lot of dramatic and good presentations but it all fades away at the end, and the human impacts (on) the environment has got rather lost and the message doesn't come through" (elderly British female in her sixties), (Ed:1st degree), (No.98).

For younger children (C):

*"From an adult point of view...not much. From a child's point of view some of it are too complex for a child to understand. ...must teach the children...so when they grow older they will save the earth" (middle-aged Singaporean male with 2 his children, a boy and a girl), (Ed:higher degree), (No.5)."
To be extended (E):
*"The only way it could be improved is to be made larger" (British male in his twenties with his son), (Ed: up to 18), (No. 8).

Use some languages (J):
*"I think it's very good... put messages in other languages" (Argentine male in his teens), (Ed: up to 16), (No. 56).

Advertise (L):
*"I didn't know it was here when I got here, so it is not very well advertised" (British female in her twenties), (Ed: up to 18), (No. 48).
*"I think it is wonderful. It is worldwide and people should be made much more aware. Perhaps you could publicize this Exhibition to start with and get people... coming from all over. I reckon you should advertise it. I've got 3 children and grandchildren and I live in Bristol and I am going home to tell them (that) all should come to see this Exhibition" (middle-aged British female), (Ed: up to 16), (No. 97).

Free admission (N):
*"This type of thing needs to be shown more often to make people aware of what governments aren't doing... and it should be free..." (British male in his twenties), (Ed: 1st degree), (No. 61).
*"Price is too expensive... but charge will put people off... less charge more people" (Moroccan male in his twenties with his daughter), (Ed: 1st degree), (No. 83).

d) DISCUSSION

Through the gallery interviews, more divergent answers were obtained than
through the questionnaires and these were classified into 3 categories: such as
1. Particularly interesting parts;
2. Basic message: and
3. Need to be improved or not. These will be discussed as follows.

1. Particularly interesting parts:
As already mentioned, most respondents answered sections of the Exhibition, For example, the section "The water cycle" was the most popular. And also other comments such as mirror effect and A-V effects are also used in the section "The water cycle". Hence through all studies which has been done by this author, it can be said that this section is the most effective exhibit from affective and cognitive points of view. In other words, new exhibitions should emphasis the affective as well as the cognitive effects in setting up educational exhibitions.

2. Basic message:
According to the basic message planned by the Exhibition planners, it is to introduce ecology and to indicate that an understanding of ecological process is essential for assessing human impacts on the natural world. Hence "human impacts on the environment" is not the main subject matter. The results of the interviews, 21% of respondents felt that the basic message was just "introduction of ecology", and 76% felt that it suggested somewhat "human impacts" or similar matters. However, this message is still just information and it is not enough to stimulate visitors to change their life style to save the planet, because the basic message "how to save the planet" felt by respondents is small percentage (3%). The results were very close to the Exhibition planners' intention.

3. Need for improvement:
The results were that the percentage of comments "it does not need to be improved" and "it is OK" were 42%; "Stress on human impacts" was 13%; and "For young children" was 8%. The comments of the first one included new style of exhibits like "The Water Cycle" which the majority of visitors enjoyed to see and study. About the second one "stress on human impacts", respondents thought the message of the human impacts was not emphasized enough. And the last one "for younger children" is a matter of course because the Exhibition was planned to be understood by visitors over 15 year olds. These last two requirements "stress on human impacts" and "for younger children" can be vital for all similar exhibitions through the world.
This section, first of all, will discuss comments on the Ecology Exhibition made by specialists in museum studies and some intellectuals. It will then make some recommendations based on previous studies of the Exhibition.

(A) COMMENTS MADE BY SOME SPECIALISTS

Some comments made by specialists and well-known persons are part of the data for psychological analysis. The comments can be divided into those who are "against" and those who are "for" the Ecology Exhibition.

AGAINST

Many criticisms concern the audio visual aspects of the Exhibition.

One specialist said in an article entitled "Innovative ecology exhibits" that "Its interactive video and spectacular effects have largely replaced traditional exhibits, something that a curator at another UK museum described as appalling" (Nature, 1991). Also the article "Stuffing knocked out of ecology...." remarked that "Ecology opts for Hollywood-style razzmatazz" (Design Week, 1991). Other specialist's detailed evaluation stated:

・ narrow spiny bridges that is the symbol of life do not so much simplify as distract;
・ a few stuffed animals, but so much AV effects; and

Similarly, Colin Davies, an architect and a freelance writer, suggested that
"This is not an exhibition of nature, it is an exhibition of gimmicks." He continued "Why do the bridges have such complicated steel structures, with spines and ribs.... Presumably they are inspired by the animal skeletons...but this seems a naive and over-literal metaphor, and besides it has only a tenuous relevance to an ecology theme". And then, he concluded that "It is one more gimmick to obscure the message" (Laris C. 1991). In addition, the "New Statesman & Society" (1991) described one specialist's view that some parts of the Exhibition are not effective in terms of AV effects and panels, and "it is neither quite a theme park nor a place to study the ecology efficiently.

**FOR**

On the other hand, most comments supporting the Ecology Exhibition are about the audio visual effects to entertain and therefore educate visitors efficiently.

For instance one commentator described the Exhibition as "Both fascinating and fun, the museum's biggest-ever new exhibition is specially designed to let visitors experience for themselves the natural relationships of the living world. And it makes no bones about how man's interference is putting some of these relationships at risk" (ME, 1991 - magazine). Also Deirdre Janson-Smith, a museum consultant, described "The water cycle" and its AV effects that "for me the compelling sensation of standing in semi-darkness by the giant quadroscope, wrapped around by images and sounds of water, still lingers." She continued in terms of learning the ecology that "For someone who knows nothing of the science of ecology, there is ample food for thought in this Exhibition.... There is much to excite and entertain, and you leave with powerful images imprinted on your mind" (Janson-Smith D. 1991).

In terms of layout, a commentator in "The Lady" said that "The layout of the displays makes the best possible use of space, winding up to second floor and weaving across walkways" (The Lady, 1991).
In addition, Jonathan Porritt commented on the Exhibition in terms of educational and political aspects. "Many of the displays and exhibits in the Ecology Gallery are designed primarily for children, and there's no doubt that it's going to be particularly useful for teachers dealing with aspects of the new GCSE curriculum." According to Porritt, "until 1985, the Ecology Party (now the Green Party) candidates spent hour after hour explaining the meaning of ecology to bemused voters on the doorstep...." and "The purists have always argued that you cannot build a political movement out of a scientific discipline." Then he suggested that the politicians ought to be given the guided tours to view the Exhibition as soon as possible (Porritt J. 1991).

CRITICISM AND ITS JUSTIFICATION

The previous comments either support or object to the Ecology Exhibition. However Alec Coles, principal keeper natural sciences, Tyne and Wear Museums Services and Giles Clarke, head of exhibition planning and education at the NHM engaged in a debate in the pages of the Museum Journal (Museum Journal, 1991: 20).

First of all, Coles commented critically on the chasm, "It is difficult to view the scene because clearings in the frosted glass are too narrow"; and about the films in the section of human impacts on the environment, it did not attract visitors properly because he counted 100 visitors through and only 7 paused before the screen (Attracting Power: 15% by this author). And then he asked some critical questions:

1. Why is there so much competing sound and vision?
2. Why is a gallery with a green message so consuming of technology and energy?
3. Why is the glass tunnel used?
4. Why are only a few specimens used?
Clarke attempted to answer these questions. His answers were as follows.

The answer related to the questions "1" and "2" is that:
- It should appeal to non-specialist visitors who wish to know more about the scientific background to environmental matters.

The answer for "why the glass tunnel?"
- It enhances the Exhibition theme of technology co-existing with nature.

The answer for "why so few specimens?"
- A gallery which depends heavily on specimens of animals which have been captured and killed is redolent of death rather than life.

Then he added some more comments that:
- It should introduce ecology and give an overview of basic concepts, and it must show that we need to understand ecological processes in order to regulate human impacts on the natural world.

All these above-mentioned comments are mainly about modern technology which is used in the Exhibition. The objectors against the Exhibition emphasized that there was too much modern technology and an absence of specimens going against the traditional nature of museums. On the other hand, supporters of the Exhibition enjoyed the way modern technology was used to efficiently educate the basic ecology to the general public. However, all those commentators must bear in mind that ecology is quite different from botany and zoology because it includes a wide range of distinctive subjects, hence naturally ecology exhibitions depend on some models, dioramas and information panels to explain the relationship between those subjects. In addition, as discussed earlier in this thesis (see pp13,14), a majority of visitors prefer modern attractive exhibitions and they tend to avoid viewing old-fashioned exhibitions.

(B) RECOMMENDATIONS BY THIS AUTHOR
Some recommendations have already been suggested after each study. Hence to avoid double comment, in this sub-section, the most important point which can be generalisable to similar exhibitions will be summarized as follows.

1. It can be a good idea to avoid a metaphorical symbolic exhibition (1) to educate ecology, for instance, in the case of the Exhibition, the complex and fragile glass structure with peep slits to see a diorama of "ecosystems" represented the essence of ecology.

2. Ecology exhibitions should also be enjoyed by small children (under 15 year olds) through the use of more interactive exhibits within a child’s conceptual level.

3. In ecology exhibitions, the sections on "human impacts on the environment" should be emphasized showing a good deal of practical information and using interactive methods.

In addition, a range of new technology may need to be used to efficiently educate visitors about basic ecology.

(1) Metaphorically symbolic exhibition:

An exhibition which communicates not in a direct way but metaphorically using abstract and symbolic explanation, interpreted by this author.

In this chapter, the Ecology Exhibition has been analysed from a psychological point of view that is 3 fundamental aspects "observation"; "questionnaire"; and "Interview in the gallery". In addition to these, some comments made by specialists in terms of the Ecology Exhibition have been looked into in order to summarize recommendations, which might be generalisable to other ecology and similar exhibitions.
CHAPTER 7

SOCIOLOGICAL ANALYSIS

AN ANTI-NUCLEAR WAR DEMONSTRATION IN BRITAIN IN 1989
(BRONZE L., & OTHERS, 1990, THE BLUE PETER GREEN BOOK)
INTRODUCTION

Sociological analysis in this research covers a wide range of study. Generally, sociological analysis in museums refers to the investigation of visitors in terms of social patterns such as sex; family groups; friendship groups; and individuals, and their behaviour. However, as far as this research is concerned, this author's interpretation of sociological analysis refers to a broader approach including the investigation of visitors' interest in the subject matter and their previous knowledge of the subject matter, in addition to their awareness of environmental issues. It also includes a study of visitors' recollections of their previous visits to the Ecology Exhibition in the NHM a year ago in order to determine how their experiences of visits influences them. All this analysis helps with suggestions as to how environmental education through exhibitions might be planned.

However, if museums exist for everyone, it is not enough to study visitors alone. The missions and objectives of museum exhibitions should be based on the needs of the general public. Consequently this research involves the general public in street interviews.

[1] GALLERY STUDIES

(A) MOTIVES FOR VISITING THE ECOLOGY EXHIBITION

Using the questionnaire, 100 visitors (58 males and 42 females balanced age groups) to the Ecology Exhibition were asked by this author about their motives for visiting the Ecology Exhibition, which were conducted from 18
December 1993 to 10 February 1994. This investigation was a part of the study of the "Gallery Questionnaire", hence the detailed method was shown in Chapter 6
[2] QUESTIONNAIRE (see pp307-310). The aim of this survey was to ascertain their interest in ecology which relates to environmental issues. The questions were as follows:

Why did you come to see the Ecology Exhibition?
1. I just happened to see it in passing.
2. I read about it somewhere.
3. Somebody told me about it.
4. Others

RESULTS AND DISCUSSION

As the same as the results of pilot study, in the main study, the majority of visitors to the Ecology Exhibition just happened to see it in passing (pilot: 8 respondents out of 8; main: 72%). However the rest of visitors (28%) had the following purposes for visiting which were: 8% of visitors read about this Exhibition somewhere; 9% were introduced it by someone; and 11% had other specific reasons such as re-visiting, children's requests, and to get some information for their schools. These results showed that nearly one third of visitors had visited intentionally, although this Exhibition was not a not particularly eye-catching exhibit like other well-known artifacts exhibits across the world. In addition, there was no significantly statistical difference between sexes at the 5% level (df=3, $\chi^2 = 2.2, p>0.1$). The results are shown graphically in figure 7.1 (p348), and the comments of other reasons for visiting which were answered by 7 visitors are quoted as follows.

NOTE: following abbreviation, numbers and terms will be used in the quotes:

a) Ed: the respondent's educational background. For example, (Ed:up to 16)
means educated up to 16 years old.

b) (No.1),(No.2) . . . : the order of the questionnaires filled by respondents which are the same as the order of the interviews answered by same respondents shown in Appendix 17.

c) Middle-aged: from 31 to 60 years old, and elderly: over 60 years old used in this thesis only.

In addition, the quotes come from the original questionnaires filled by the respondents, hence it might include some grammatically incorrect sentences or spoken languages (Note: the following quotes are not shown in Appendix 17).

*"I have been to see it before and was greatly impressed by it" (British male in his twenties with a child), (Ed: up to 18), (No.8).

*"I knew it was here from a previous visit and was interested to go round again, as was my daughter" (Middle-aged British male with his daughter), (Ed: up to 18), (No.13).

*"Known about it for ages" (Middle-aged South African male in his late fifties), (Ed: 1st degree), (No.93).

*"Have always wanted to come" (Middle-aged British Female), (Ed: up to 16), (No.97).

*"My daughter wanted to see it" (Middle-aged British female with her daughter - 8 years old), (Ed: up to 16), (No.52).

*"Because a colleague bringing children" (Middle-aged British female), (Ed: up to 16), (No.53).

*"Came to do some sketches for my art project, also to study more about our world" (Japanese male in his late teens), (Ed: up to 18), (No.15).
motives for visiting the ecology exhibition, the num

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<thead>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>TOTAL</th>
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<td>9</td>
<td>100</td>
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<tr>
<td>NUMBER</td>
<td>27</td>
<td>4</td>
<td>5</td>
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<td>42</td>
</tr>
<tr>
<td>TOTAL (%)</td>
<td>72</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>100</td>
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</tbody>
</table>

Why did you come to see the Ecology Exhibition?

1. I just happened to see it in passing.
2. I read about it somewhere.
3. Somebody told me about it.
4. Others

No significantly statistical difference between sexes at the 5% level ($df=3, \chi^2 =2.2, p>0.1$).

J.H. Iuchi 1993/4

Fig 7.1

Motives for Visiting the Ecology Exhibition

-348-
EDUCATIONAL BACKGROUNDS OF VISITORS

The educational backgrounds of 250 visitors to the Ecology Exhibition were investigated through the "Gallery Questionnaire" and the "Ecology Quiz", from December 1993 to February 1994. The methods of the investigation are shown in "Gallery Questionnaire" (see pp307-310) and "Ecology Quiz" in the next subsection (pp351-354). Such data is unique. For instance, "NHM visitor survey 1991" only surveyed the science qualifications of visitors. Also, the "visitor questionnaire" in the leaflet entitled "Guide" does not ask for such data either (see Appendix 18). There are difficulties in comparing academic backgrounds/levels across different educational systems, and so it is problematic to ask this question in a questionnaire without direct help of museum staff. In addition, asking visitors about their educational backgrounds might be seen to be offensive (see p146), not unlike asking a respondent's exact age. There is a danger of embarrassing potential respondents who have limited formal education. The aim of this investigation is to ascertain visitors' educational levels in order to reform the Exhibition for their needs, and to enlighten those groups with limited education. The results and discussion are as follows.

RESULTS AND DISCUSSION

The method of question is "category" which means that respondents can choose only one from 4 categories that is 1) Up to 16 (e.g. secondary school); 2) Up to 18 (e.g. sixth form college); 3) First Degree; and 4) Higher Degree. The difference between males and females in relation to their educational backgrounds was limited. The number of undergraduates surveyed of both sexes was very similar, and only male postgraduates (24%) outnumbered females' (12.1%). The percentage of respondents who had some post secondary education was 54.4% including 15.2% who were post graduates.
According to "World Resources 1992-93" (The World Resources Institution, 1992: 254-255), even in Canada, the country with the highest educational level within countries for which data is available, only 40.2% of males, who are 25 years old and over, have some post secondary education. Similarly for Germany the figure is 21.3%; Singapore is 4.8%; and Algeria is 0.5% (UK: no data). Hence the results suggest that the visitors surveyed had relatively high academic backgrounds. Also, according to "NHM Visitor Survey 1991" (see p164), the percentage of visitors' "Social Class" A and B was 41% (NOTE: total percentage of social class A and B in the UK is approximately 13% - see Appendix 4).

Generally the higher the level of educational academic backgrounds, the higher social status people have. Consequently the Exhibition must meet the needs of this group yet at the same time, enlighten wider audiences to the subject matter using whatever methods are suitable. The results are shown in figure 7.2 as follows.

**VISITORS' EDUCATIONAL BACKGROUNDS**

**IN THE ECOLOGY EXHIBITION, THE NHM**

<table>
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<tr>
<th>SEX</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALE (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER</td>
<td>23</td>
<td>39</td>
<td>48</td>
<td>24</td>
<td>134</td>
</tr>
<tr>
<td><strong>FEMALE (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER</td>
<td>20</td>
<td>32</td>
<td>50</td>
<td>14</td>
<td>116</td>
</tr>
<tr>
<td><strong>TOTAL (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER</td>
<td>43</td>
<td>71</td>
<td>98</td>
<td>38</td>
<td>250</td>
</tr>
</tbody>
</table>

1) UP TO 16  2) UP TO 18  
3) FIRST DEGREE  4) HIGHER DEGREE
(C) ECOLOGY QUIZ

a) AIM

Recently people's awareness of environmental issues has been raised, and some terminology related to "ecology" has been used through school education and mass media. However, in terms of the general public's level of understanding of ecology, little data is available. Ecology embraces a wide range of subjects such as earth science, biology and zoology, and it is probably complex for the general public to understand. That is why the "ecology quiz" was conducted with visitors to the Ecology Exhibition in the NHM.

The quiz asked visitors, who are about to see the Exhibition, in order to ascertain their previous knowledge of ecology. The differences between understanding levels before and after experiencing the Exhibition were not studied. The reason was that the results might not be of value because if visitors know they are being tested, they might make special efforts to get a good later score on the Ecology Quiz. A part of the quiz was directed at the general public in the streets in London which will be analysed in due course later in the section entitled "Street Interview" (pp408,413).

The main aim of this research is not only to ascertain visitors' knowledge of ecology but also to get some hints on the creation of effective ecology exhibitions. Moreover, the quiz is a part of education services. After finishing the quiz, correct answers were revealed to the respondents so that the time spent answering the quiz was not wasted for visitors, and hopefully also they could understand and enjoy much more of the Exhibition.

b) METHOD
SAMPLING

100 visitors to the Ecology Exhibition who were about to see the Exhibition were asked if they would attempt the "Ecology Quiz". The respondents were balanced in terms of sex and age to avoid biased results. The age groups which were used in this study were: (1) 10 to 20 years; (2) 21 to 30 years; (3) 31 to 60 years; and (4) over 60 years old, that is (1) is older children (mainly high teens); (2) is young adults; (3) is middle-aged persons (Note: this is a term used only for the purpose of this study). Basically the number of respondents in each group should be equal, but about category (3) middle-aged persons, it should be larger than (1) or (2), because of the wider range. However as far as category (4) over 60 is concerned it should be the smallest because the number of visitors is extremely small and the possibility of agreeing to answer the quiz might be the lowest. Hence a statistical test of differences between age groups is not relevant to this research.

HOW TO ASK

Visitors were asked totally randomly within a limited number of each sex and age group. The respondents did include foreigners to get various answers from across the world, and if their answers were not relevant for the analysis because of a problem in English, only these answers were eliminated. In addition, to make visitors agree to answer the quiz, it was explained that there were only 4 questions and if they had one correct answer, then they would be given an "Ecology Certificate" (which was made by this author as a souvenir - see appendix 20). It was also explained to the visitors that completion of the quiz would take only a few minutes. The idea was that the possibility of gaining a certificate might boost the participation rate.
CONTENT OF THE ECOLOGY QUIZ

The Ecology quiz consisted of four questions which were fundamental to an understanding of ecology (see Appendix 19). All questions related to the Ecology Exhibition, hence the answers could be found during a tour of the Exhibition. They are as follows.

1. The meanings of four technical terms that is "atmosphere"; "hydrosphere"; "lithosphere"; and "biosphere":
   These terms look at the earth from four different angles to do with "air"; "water"; "rock"; and "life", and these have to be understood for studying ecology from the macro viewpoint.

2. The meaning of "ecology":
   Respondents can choose a right answer from the answer column which shows four similar answers. Two answers only describe a part of ecology, but they are not enough to cover the general meanings of ecology. Another answer takes a much more medical scientific point of view concerning the relationship between UV (ultraviolet) rays and skin cancer. Needless to say, in this author's view, to grasp the meaning of ecology is vital in the modern world.

3. The meaning of "photosynthesis":
   Respondents can choose a right answer from the answer column which shows four alternative answers. The question does not use the term photosynthesis, but in a roundabout way, asks which one such as green plants; animals; both green plants and animals; or all living things can directly convert the sun's energy into a usable form. The answer is green plants. However strictly speaking, blue-green algae also can manufacture its own food supply from inorganic material by photosynthesis (Guinness
Publishing, 1990:177). But generally speaking, the answer is green plants, and also, in the Exhibition, this answer is given by the specialists. The green plants can store the primary energy from the sun. Hence a study of photosynthesis is vital to understand ecology. This question arguably might be a bit more difficult than the "1" and "2".

4. The meanings of "chain"; "web"; and "pyramid":

Similarly, respondents can choose a right answer from the answer column which shows four alternatives. The question asks whether these three terms refer to different stages, or different ways, or the same meanings in terms of looking at energy and raw materials moving through living communities. The correct answer is "different ways". Different stages refer to the process of one phenomenon considered sequentially. This question is more complex than the earlier questions. To understand these terms it is vital to be aware about the nutrient cycle from the sun's energy to tertiary consumers including humans which have had destructive impacts on the environment. In addition to these, another wrong answer describes the method of building an Egyptian pyramid which might make respondents laugh.

In addition, the respondents can get a colour star seal on the quiz sheet with a red star for 1-correct; silver star for 2-correct; gold star for 3-correct; and green star for all-correct and called "distinction". The results are shown as follows.

c) PILOT STUDY

The pilot study was conducted on 21 January, 1994. The number of respondents was 7 with a mixture of ages and sexes. Their nationalities included British, American and Swedish. The results and discussion follow.
RESULTS AND DISCUSSION (PILOT)

Although only 7 respondents were tested, the results were predictable. First of all, the number of correct answer of question "1" was 6, "2" was 4, "3" was 5 and "4" was 1. The results mean that question "1" was the easiest and "4" was the most difficult. Hence four questions were arranged from easy to difficult sequentially as expected. Secondly, 5 respondents gained silver or gold stars (2 or 3-correct), and other 2 respondents gained a red or a green star each (1 or 4-correct). Hence, the quiz was neither too easy nor too difficult. In addition, all successful respondents enjoyed receiving an "Ecology Certificate". As a result of this pilot, the quiz was unchanged.

d) MAIN STUDY

The main study was conducted with 100 visitors balanced across sex and age from 26 to 29 January, 1994. In terms of their nationality, 64% of them were British, and the other 36% were from 20 countries. When visitors were asked if they would take part in a quiz, most of them were puzzled and were about to refuse, but this researcher immediately pointed out to them that they would receive a certificate if they could answer one out of four correctly. As a result, the majority willingly accepted the challenge. The results are shown as follows.

CORRECT RESPONSE RATE OF EACH QUESTION

The first question asked about the meaning of atmosphere, hydrosphere, lithosphere and biosphere. 75% of respondents gave the correct answer. Similarly, the second question about the meaning of ecology led to a 72% correct response rate. The third question about the meaning of photosynthesis produced a 60% correct response rate. The last question about the meaning of chain, web, and pyramid in the discipline of ecology gained a 40 % correct response rate.
This result showed the majority of the respondents were uncertain about these technical terms, "chain", "web" and "piramid". The results are shown graphically in figure 7.3 below.

**CORRECT RESPONSE RATE OF EACH QUESTION OF THE ECOLOGY QUIZ IN THE NHM**

<table>
<thead>
<tr>
<th>No. OF QUESTION</th>
<th>THE MEANING OF</th>
<th>NUMBER OF RESPONDENTS: 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ATMOSPHERE, HYDROSHERE, LITHOSPHERE AND BIOSPHERE.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ECOLOGY.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PHOTOSYNTHESIS.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CHAIN, WEB AND PYRAMID.</td>
<td></td>
</tr>
</tbody>
</table>

**RESPONDENTS' CORRECT RESPONSE RATE**

This analysis examined how many correct answers respondents had. Hence the results shows 4 cases that is from one-correct to four-correct. Overall the differences between sexes were limited. For instance, the percentage of 4-correct was 16% in each sex. Similarly 3-correct was 36% for male, and 39% for female, and the case of no correct answer was 3% for male, and 4% for female. However, as far as groups with 2-correct, males' score was a bit higher than females' (36% for males and 23% for females), and about 1-correct, oppositely males' score was a bit lower than females' (9% for males and 18% for females). However, the differences were not statistically significant at the 5% level ($\chi^2 = 3.12; \text{df}=4; p>0.1$). The results are shown graphically in figure 7.4 below.
The statistical difference between sexes: $\chi^2 = 3.12; \, df=4; \, p>0.1$

Not significant at the 5% level.
e) DISCUSSION

As mentioned in the method (p353), question "1" might be the easiest, but 25% of respondents could not answer it correctly. The most difficult term might have been "lithosphere", but if they knew other terms such as atmosphere, hydrosphere and biosphere, they could identify lithosphere as a matter of elimination. From the results, it can be said that 25% of respondents did not know 2 terms or more. It suggests a need for education in the basic technical terms of ecology.

As to the second question concerning the meaning of ecology, 28% of respondents could not answer the question correctly. However, this question was more difficult and complicated than question "1", because respondents had to choose between 4 similar statements. The important point behind this answer is that the general meaning of ecology is not only the study of living organisms, or humans and the environment, but living organisms and their physical environment. The physical environment is vitally important role for maintaining ecosystems. The study between humans and the environment however relates to "environmental science" (Jones G., Robertson A., Forbes J. & Hollier G., 1990:150), or "human ecology" (Collin P. 1992:110). Hence they are specific disciplines within ecology. From these results, there is a need for the general public to be educated about the role of the physical environment in ecology.

The third question asked the meaning of photosynthesis in a roundabout way, and 40% of respondents were confused or did not fully understand the role of the photosynthesis. The sun's energy is trapped by green plants and the energy is converted into a usable form - carbohydrates that is "energy". Some respondents thought that lizards use sun's energy to give themselves a boost. It is right but they cannot directly convert the energy into a usable form. Also some respondents thought that animals use or need the sun's energy to synthesize
vitamin D. It is also right but vitamin D is not "energy" but helps produce calcium. In addition, one respondent said some bacteria also can photosynthesize. That is true. It is called "cyanobacteria" or "blue-green algae" but it is a very specific case, hence in general, we can say that only green plants can do it. The important point of this answer is that only green plants can store the sun's energy directly by the process of photosynthesis. The general public need to be educated about this point.

The last question asked the meaning of chain, web and pyramid in ecology, and only 40% of respondents gained the right answer which was different ways of looking at energy and raw materials moving through living communities. Some respondents chose different stages, or suggested that these 3 terms had the same meaning. Also some respondents even suggested that these terms are one of the methods of building an Egyptian pyramid - a "chain" was used to pull stones and a "web", which means a net, was to support a pile of stones. They clearly did not see the joke! The chain might have been familiar to them, because the term "food chain" is nowadays used a great deal. The web is probably a high level term, and the pyramid is probably the most difficult term. However, we human beings belong to tertiary consumers which are on the top of the pyramid in the trophic levels (Spurgeon R. 1988:9). Hence all results of human impacts on the environment return to, and influence humans through the food chain. This point of view should be a focus for the education of the general public.

In addition, as shown in figure 7.4 (p357), the percentage of those gaining all-correct, and those with 1 or no-correct were relatively small. The majority of respondents (67%) answered 3 or 2 correctly. Hence the level of the quiz was neither too easy nor too difficult for the general public. The test could be said to have been a good "discriminator", that is the marks distribution was "normal". Furthermore, the differences between sexes were focused upon, and it
might be said that both male and female visitors' previous knowledge of ecology seems very nearly the same.

(D) AWARENESS OF ENVIRONMENTAL ISSUES

In order to ascertain how visitors' awareness of environmental issues, some relevant questions were asked through questionnaires and interviews in the Ecology Exhibition, the NHM, London. The methods was exactly the same as previous study of "[2] Questionnaire" and "[3] Interviews" in chapter 6 (see pp310, 326), because respondents were the same people. The study consisted of 5 fundamental questions. The content and aims of the questions are as follows.

a) QUESTIONS

1. To what extent, are you prepared to change your life-style to help "Save the Earth"? (questionnaire)

   Respondents were asked to choose "one" from the 5-scale semantic differential that is from "not at all (1)" to "a great deal (5)".

   AIM: To determine how people feel about environmental issues.

   Some people might have already changed their life-style, so the answers might be "not at all", but in fact the answers might belong to "a great deal". Hence some prompt is needed. Also, this question seems to be vague because it does not give details on specific life-style changes, but this study tries to determine people's feelings about environmental issues in general.

2. Whose future responsibility is it to "Save the Earth"? (questionnaire)

   Respondents are asked to choose only one from a) Government; b) employers; c) conservation groups; and d) individual persons.
AIM: to ascertain the group considered most responsible as well as the extent of responsibility at an individual level.

It is very difficult to choose only one category because they might think that every category has equal responsibility. Hence, it became inevitable that this researcher had to accept plural answers.

3. If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it? (questionnaire)

AIM: To determine the degree of interest in ecology exhibitions and environmental issues.

This is both a leading question and a hypothetical question which normally should be avoided (see p145). However, it was asked intentionally. According to recent studies, museums and exhibitions are now not so popular among the public. That is why the question speaks of the case of "a very attractive exhibition". However even the question asks this, some people might not want to see such an exhibition. In addition, some people might think that it depends on how far it might be from their own residence, but this question asks visitors simply their general intention of visiting such an ecology exhibition.

4. Have you ever taken part in any event on environmental issues? (interview)

AIM: To determine the degree and nature of people's practical actions to "Save the Earth".

Many different actions will be hopefully specified which should help to ascertain the extent to which people will be prepared to act to "save the earth".

5. Is there anything else you would like to comment on about environmental issues in general? (interview)
AIM: To determine the environmental issues in which visitors are interested. These data are likely to be wide ranging and the variety information will be obtained through open-ended interviews with the general public. The results might give food for thought not only for setting up ecology exhibitions but also for other disciplines involved in environmental issues.

The results of the pilot and the main study and the discussion now follow.

b) PILOT STUDY

The pilot study was conducted on 17 (Friday) December, 1993, when visitor density was "fairly crowded" (see p288). 8 visitors, who were about to leave, agreed to answer the questionnaire and to be interviewed. Full details of this approach are shown in the "[2] Questionnaire" in Chapter 6 (see p307-310).

RESULTS AND DISCUSSION (PILOT)

1. Whether visitors are prepared to change their life-styles to "save the Earth": 6 respondents out of 8 chose "3" or "4" on a scale of "1" (not at all) to "5" (a great deal). It is not easy to change a life-style, but the respondents had a somewhat positive response to this question because the results were skewed to the right. In the main study, the same results might be obtained.

2. Whose future responsibility it is to save the earth:
   6 respondents out of 8 chose "individual persons"; 2 respondents answered "Government"; and nobody chose "employers" and "conservation groups". The results showed that most respondents felt that each person's awareness is vital. The same results hopefully might be confirmed in the main study.
3. Whether visitors want to see very attractive ecology exhibitions:
   The results diversified from "2" to "5" on the scale of "1" (definitely no) to "5" (definitely yes), although this is a leading question which used the description "very attractive exhibition". However the result was a bit skewed to the right. In the main study, the positive answers might not be so common.

4. Whether visitors took part in the events on the environmental issues:
   5 respondents out of 8 said "yes indirectly or directly", and 3 respondents said "no". The results showed that over 60% of respondents took part in the some events on the environmental issues although direct action conducted involved only one respondent. In the main study, it is possible that a wider variety of events might be specified.

5. Free talking about environmental issues:
   4 respondents out of 8 spoke about certain issues or the importance of awareness; 2 respondents focused on the Government's responsibility; and one of them spoke of the importance of the role of museum education. In the main study, it might be hard to analyse the results statistically, because the content of the interviews was very complex. However it should be done if at all possible, but the content of each interview might be interesting and beneficial.

C) MAIN STUDY

The main study was conducted from 18 December, 1993 to 10 February, 1994 for 9 days. Visitor density for 50% of that time was "fairly crowded", 30% was "very crowded" and 20% was "less crowded". The number of respondents was 50 solitary visitors and 50 groups. Other detailed contents of the method is shown
in "[2] Questionnaire" in Chapter 6 (see p310), because the respondents were exactly the same as those of that study. The results and discussion are as follows.

1) CHANGING A LIFE-STYLE TO SAVE THE EARTH

This question asked visitors to what extent, whether they are prepared to change their life-styles to save the Earth. Most respondents chose "3" or "4" on the scale of from "1" (not at all) to "5" (a great deal). The mode was "4", mean was "3.5". In addition to these, females' answers were slightly more positively skewed than for the males'. However, as far as statistical analysis of the difference between sexes, no significance was shown at the 5% level ($X^2 = 3.55$, df=4, p>0.1). The results are shown graphically in figure 7.5 (p365).

2) WHOM FUTURE RESPONSIBILITY FOR SAVING THE EARTH

This question examined visitors' opinions about "whose future responsibility it is to save the Earth". As expected from the pilot study, the answer "individual persons" was prominent and was 65%. The second greatest number of answers was for "Government", but much lower than the former, and was 28%. The answers for "employers" and "conservation groups" were extremely low, that is 3% and 4% respectively which were similar figures to the pilot study. As shown in the table in figure 7.6, it is quite obvious that the statistical difference between sexes is not significant at the 5% level ($X^2 = 2.85$, df=3, p>0.1). The results of this study are shown graphically in figure 7.6 (p366).
**VISITORS' INTENTION TO CHANGE THEIR LIFE-styles TO SAVE THE EARTH, ASKED IN THE ECOLOGY GALLERY, THE NHM**

**Fig 7.5**

J. H. IGUCHI 1993/4

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<th></th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td><strong>MALE (No)</strong></td>
<td>3</td>
<td>7</td>
<td>21</td>
<td>16</td>
<td>11</td>
<td>58</td>
</tr>
<tr>
<td>(%)</td>
<td>5</td>
<td>12</td>
<td>36</td>
<td>28</td>
<td>19</td>
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<tr>
<td><strong>FEMALE (No)</strong></td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>18</td>
<td>9</td>
<td>42</td>
</tr>
<tr>
<td>(%)</td>
<td>5</td>
<td>7</td>
<td>24</td>
<td>43</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL (%)</strong></td>
<td>5</td>
<td>10</td>
<td>31</td>
<td>34</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

I: Not at all
5: A great deal

**MODE:**4

**MEAN:**3.5

The statistical difference between sexes:

\[ \chi^2 = 3.55, \text{df}=4, p>0.1 \]

*Not significant at the 5% level.*
VISITORS' OPINIONS AS TO WHOSE FUTURE RESPONSIBILITY IT IS TO SAVE THE EARTH, ASKED IN THE ECOLOGY EXHIBITION, THE NUM J. H. IGUCHI 1993/4

<table>
<thead>
<tr>
<th></th>
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<td>5</td>
<td>70</td>
<td>108</td>
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<tr>
<td></td>
<td>28</td>
<td>3</td>
<td>4</td>
<td>65</td>
<td>100</td>
</tr>
</tbody>
</table>

1: GOVERNMENT  
2: EMPLOYERS  
3: CONSERVATION GROUPS  
4: INDIVIDUAL PERSONS

MODE: 4

No significantly statistical difference between sexes at the 5% level ($\chi^2 = 2.85$, df=3, $p > 0.1$).
3) VISITORS' INTEREST IN ECOLOGY EXHIBITIONS

This question investigated the degree of visitors' interest in ecology exhibitions which particularly described human impacts on the environment. Although this was a leading question which mentioned the description "very attractive exhibition", the results were similar to the pilot study that 18% of respondents answered "3" on the scale of from "1" (definitely no) to "5" (definitely yes); 36% of them chose "4"; and 41% of them said "definitely yes". The results showed that about 60% of respondents might not have been so keen to visit such kinds of exhibitions or maybe any exhibition. However the distribution of the data was skewed to the right. The mode was "5" and the mean was "4.1". In addition, as seen in the table in Figure 7.7, no significantly statistical difference between sexes was found at the 5% level ($\chi^2 = 4.21$, df=4, $p>0.1$). The results are shown in figure 7.7 below.

**Fig 7.7** J. H. IGUCHI 1993/4

**VISITORS' INTEREST IN VISITING A VERY ATTRACTIVE ECOLOGY EXHIBITION, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT" ASKED IN THE ECOLOGY EXHIBITION, THE NHM,**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td></td>
<td></td>
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<td>22</td>
<td>58</td>
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<tr>
<td>(%)</td>
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<td>2</td>
<td>6</td>
<td>15</td>
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<td>42</td>
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<tr>
<td>(%)</td>
<td>0</td>
<td>5</td>
<td>14</td>
<td>36</td>
<td>45</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1</td>
<td>4</td>
<td>18</td>
<td>36</td>
<td>41</td>
<td>100</td>
</tr>
</tbody>
</table>

1: Definitely no  
5: Definitely yes

Mean: 4.1, Mode: 5

No significantly statistical difference between sexes at the 5% level ($\chi^2 = 4.21$, df=4 $p>0.1$).
4) PARTICIPATION IN EVENTS ON ENVIRONMENTAL ISSUES

This question asked visitors of their experiences in taking part in events concerning environmental issues. This study was conducted by interviews, hence various data have been obtained. The results showed that 66% of respondents had no experience of such focus of participation; 9% of them had some experiences indirectly; and 25% of them had some direct experiences. Similarly, no significantly statistical difference between sexes was obtained at the 5% level (χ² = 2.57; df=2, p>0.1).

INDIRECT ACTIONS

Of these answers, most people had attended some courses related to this matter such as courses in ecology or biology. Another example was having signed on a
signature-collecting campaign to do with environmental issues. It might be one of the fundamental indirect action to these issues, which is shown below.

NOTE: "Ed" shows the respondent's educational background; "No." is respondent's number which is shown in Appendix 17 with his or her full transcription; Middle age means from 31 to 60 years old, and elderly is over 60 defined in this research only. In addition, these transcripts come from original tapes recorded.

*In Portsmouth they wanted to build a burner (incinerater) and thousands of us signed a petition and it was stopped (elderly British male), (Ed:up to 18), (No.73).

DIRECT ACTIONS

Within direct actions, 36% of them were conducted by members of some conservation groups, that is 5 from "Greenpeace", and others from WWF (World Wide Fund for Nature), FoE (Friends of the Earth), and other minor groups. Some examples of transcriptions are as follows.

*"Yes, I am a member of the World Wide Fund for Nature and I am working for an organisation that collects money for building schools in third world countries" (Danish female in her early twenties), (Ed:up to 18), (No.84).

*"Yes, a member of Greenpeace and anti-nuclear marching...I am not an activist...but I just believe in it" (British male in her late twenties), (Ed:1st degree and studying environmental science), (No.78).

*"Yes, lots. I'm a member of the Friends of the Earth. We have made many demonstrations about sewage in the sea and the green environment" (elderly British female), (Ed:1st degree), (No.98).
Also the respondents included 4 professional conservationists. Of these, there was a coral reef conservationist. He remarked that:

*"Yes, I am a diver and we save corals...we transplant corals to another place...we take the coral and transplant it" (middle-aged Singaporean male with 2 his children, a boy and a girl), (Ed:higher degree), (No.5).

Other answers were 2 concerning road campaigns and 6 giving general help such as cleaning towns and joining events for recycling. In addition, 4 respondents said just "yes". The results are shown graphically in Figure 7.8 as follows.

**Fig 7.8**

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Indirect</th>
<th>Yes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male (No)</strong></td>
<td>42</td>
<td>4</td>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>7</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td><strong>Female (No)</strong></td>
<td>24</td>
<td>5</td>
<td>13</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>12</td>
<td>31</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td>66</td>
<td>9</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

No significantly statistical difference between sexes at the 5% level ($\chi^2 = 2.39$, df=2, p>0.1).
5) GENERAL OPINIONS ON ENVIRONMENTAL ISSUES

In this question, respondents were given the chance of elaborating on any matters related to environmental issues, and 59 respondents answered this question (35 males and 24 females). As far as statistical analysis is concerned, it is hard to draw conclusions because these results were very complex. However the overall trends of the data have been summarised. As a result, one third of respondents talked just about environmental issues; 17% of them said individual awareness was needed; again 17% of them drew attention to the lack of the Government awareness or lack of action; 15% of them said more education was needed; 6% of them explained why the situation was getting worse; and 3% of them thought greater employers' awareness was needed. However 8% of respondents said the situation was getting better.

Within these categories, the content of environmental issues commented on by visitors were varied. The main themes were: problem of using fossil fuel for cars; oil fields destroying the environment; to develop alternative energy such as solar energy; rubbish problems such as litter on the roads and dumping into seas; unnecessary and excessive packaging; problem of increasing population and urbanisation; ozone layer depletion; disappearing forests; problem of developing coniferous forests; poaching and jail-like zoos; and many issues from across the world. Within them some relevant comments are quoted as follows.

*"...there is too much car travel and there should be more resources put into public transport in my view" (middle-aged British male with his daughter), (Ed:up to 18), (No.13).

*"(English too poor)...people do not clean up after using...paper and plastic...very much...throw away...everything" (middle-aged Norwegian female), (Ed: higher degree), (No.60).
*"We have some very significant problems because of the urbanisation that has happened. Masses of people have moved out of the countryside to the city... and they don’t have any concern for their environment.... All they are concerned with is to get enough bread in their stomachs to live through to the next day.... We’ve just come back from Disneyland.... They are creating an enormous amount of rubbish...everything is thrown away.... Can you imagine 14m tourists? Amount of rubbish. I don’t know where it’s going.... The poachers who are selling the horns...rhinos...that is the big problem ...." (middle-aged white South African female), (Ed: up to 18 with her daughter), (No. 79).

*"...I am very interested and I try to be very careful in my own environment... we have lots of trees.... Apart from that, I am disgusted with growing pine forests...10 million pine trees is not a managed forest...it is just like growing grass...they need many species" (middle-aged Australian female), (Ed: up to 18), (No. 82). [Note: the plantation of coniferous for timbers is almost devoid of wildlife because the rows are too close together that hardly any light reaches the forest floor, and so nothing grows among them (Bronze, Heathcote, Brown, 1990:13)].

*"I saw the photo exhibition of wildlife in the NHM just before. Of the photos, an orang-utan squats in a jail-like cage in the zoo, and I felt it was pity. We want to see real animals but it is unfair to keep them in zoos. I don’t want to go to the zoos keeping the animals because we humans belong to the same animals" (Japanese male in his late teens), (Ed: up to 18), (No. 15).

All other contents of comments were varied such as "individual awareness"; "governments and employers' responsibility"; "importance of education"; "optimistic views"; and "cause of issues". Some clear and relevant comments are quoted as follows.
"I think there is individual responsibility...change their attitudes and change the ways of the world depend on the individuals...persons, who are influential to the Government and employers and conservation groups, so it all stems from the individual" (British male in his late teens), (Ed:up to 18, and going to university), (No.9).

"It might be too late to recover our environment, but we mustn't destroy it anymore, and children should be educated by like this exhibition to save the earth" (Japanese male in his twenties), (Ed:1st degree), (No.68).

"I think it should be more stressed and publicized. I think, more ought to be done about it in schools, making people aware. If we don't do anything we are not going to have anything left for the next generation" (elderly British female), (Ed:higher degree), (No.39).

"Sometimes it seems to me that the Government overrides the wishes of the people...that's probably the same everywhere" (elderly British male), (Ed:up to 18), (No.90).

The next two examples arguably are too optimistic on these issues.

"In Denmark it has a good environment because they have strict restrictions" (Danish female in her early twenties), (Ed:up to 18), (No.84).

[Note: Denmark is one of the most contaminated countries by acid rain. The PH is sometimes around 4 (Bishop V. & Prosser R. 1992:173)]

"...but I think the earth has plenty of ability to correct itself. I don't believe in the greenhouse effect.... I don't believe in the ozone thing.... I don't believe that exists. I believe the more carbon dioxide is produced by industry, the more green plants grow. ...so I think the earth corrects itself" (middle-aged British male with a male friend), (Ed:higher degree), (No.75).

These comments are summarized in figure 7.9 below.
### Content of Interviews to Visitors about Environmental Issues

In general, asked in the Ecology Exhibition, the NM

<table>
<thead>
<tr>
<th>Main Answers</th>
<th>(No) %</th>
<th>Content Summarised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issues Spoken about</td>
<td>(20) 34%</td>
<td>less cars more walking/more public transport/abusing by my car/during driving less communication with friends/problem of oil fields in Siberia and UK/contaminated sea by oil in Argentina/dumping nuclear waste into thesea/untidy on the roads with rubbish/rubbish on the coast in Argentina/better solar or alcohol energy/afraid of ozone layer depletion/urbanisation problem/population explosion/planting pine trees causes dead area for others/disappearing rainforest in Brazil/unnecessary packaging/cutting down trees for making factories in South Africa/poaching rhinos for their horns/zoos are like jails/problem in South Africa is bigger than South America/lots of world issues.</td>
</tr>
<tr>
<td>Individual Awareness</td>
<td>(10) 17%</td>
<td>nothing much is being done on the issues/heading down a difficult road/things must be done individually first/just individuals can save the earth/individuals have got to work first/it all stems from the individual/we have to think more about/we need to protect for future/advertise to get the message across the people/we all understand it but no one takes any notice.</td>
</tr>
<tr>
<td>Category</td>
<td>Percentage</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td><strong>GOVERNMENT</strong></td>
<td>17%</td>
<td>To save rainforest depends on efforts of governments or NGOs/little democracy in Government on caring for need for Government's support first/Government says what they have to say to get by/need for political power/Government has more power to do things than individuals/need for more power as local governments/Government overrides the wishes of the people/French Government still has to do a lot on these issues/UK Government must be aware of sustainability.</td>
</tr>
<tr>
<td><strong>EDUCATION</strong></td>
<td>15%</td>
<td>Children must be educated by exhibitions/children might be more easily educated than adults/exhibitions can make individuals aware/teach people/more school education is needed/education is extremely important/education gives people a moral sense and responsibility/need more education in Morocco/environmental education is getting better in South Africa.</td>
</tr>
<tr>
<td><strong>OPTIMISTIC VIEW</strong></td>
<td>8%</td>
<td>Good environment in Denmark (Note: the worst area of acid rain)/everything is getting better in Jersey/young people are much more aware of the ecology/the earth has plenty of ability to correct itself.</td>
</tr>
<tr>
<td><strong>CAUSE OF ISSUES</strong></td>
<td>6%</td>
<td>In the developing countries, &quot;greens&quot; are never strong/economic problems cause the issues.</td>
</tr>
</tbody>
</table>
d) DISCUSSION

Through the methods of questionnaire and interview, visitors' awareness of environmental issues has been examined from five different points of view. Through this study, no significantly statistical differences between sexes existed at the 5% level. It might be said that for awareness of environmental issues, males and females are equally aware. The discussion for each result is as follows.

1. VISITORS' INTENTION TO CHANGE THEIR LIFE-STYLES TO SAVE THE EARTH

It is a general question which does not ask about any particular change in life-style. As shown in figure 7.5 (p365), it is not easy to change their life-styles which have been stable for a long time. Nearly 50 percent of respondents ticked from "1" to "3" on the scale of from "1" (not at all) to "5" (a great deal). Some respondents have already changed some part of their life-styles, so in that case, this researcher asked them to tick some number imagining that if they did not change their life-styles yet, because if not prompted, they might have been ticked close to "not at all", but they were very aware of environmental issues. On the other hand, 54% of respondents ticked "4" or "5" that is "a great deal", and the mode is "4". It might suggest a promising trend towards saving our environment. However, the respondents might
have been a particular kind of group because they visited the Ecology Exhibition. Consequently, the same question will be asked to school children and their teachers by mailed questionnaires and interviewed pedestrians in London, together with question 2, 3 and 4 below.

2. VISITORS' OPINIONS ON WHOSE FUTURE RESPONSIBILITY IT IS TO SAVE THE EARTH

It might be very hard to choose one from "Government"; "employers"; "conservation groups"; and "individual persons, because they all have some responsibility. However the majority of respondents thought the highest priority category was individual persons that is 65%, and second most common answer was "Government" that is 28%. This might be a hopeful trend towards saving the environment because a society consists of individual persons, and they can pressure a Government. However within respondents who answered "Government", there might have been some people who over depend on Government action to save the environment. Hence in cases like this, more education is arguably needed to make them aware of individual responsibility of these issues. On the other hand, the answers for "employers" and "conservation groups" were only 3% and 4%, because respondents had no chance to choose 2 or over, consequently more powerful category that is "Government" might have been chosen. Also it might be said that respondents did not want to depend on the conservation groups rather they thought that the individual's effort is more important.

3. VISITORS' INTENTION TO GO TO SEE THE VERY ATTRACTION ECOLOGY EXHIBITION DESCRIPTION HUMAN IMPACTS ON THE ENVIRONMENT

This is a hypothetical and leading question using the explanation "if" and "very attractive exhibition", however it was intentionally made like this as was
mentioned above (see p361). In spite that it was leading respondents to answer the question positively, 23% of them did not want to go to see it willingly as showed that 1% of them ticked "1"; 4% of them ticked "2"; and "18% of them ticked "3" on the scale of from "1" (definitely no) to "5" (definitely yes). On the other hand, positive answers were not so small number that is 36% of them ticked "4"; 41% of them answered "5", and hence the mode was "5" and the mean was "4.1". However if it was not a "leading question", it might have resulted in a lower number of positive answers than was obtained. Through previous study in this thesis (see p13,14,103-105,169,304,312,315,337,342,343), people want more affective and attractive exhibitions than traditional exhibitions which bore the public and keep them away. Hence, it might be said that in order to urgently educate the public in environmental issues for example, exhibitions should be attractive.

4. WHETHER THEY HAD TAKEN PART IN ANY EVENTS ON ENVIRONMENTAL ISSUES

The majority of respondents had not taken part in any events on environmental issues, even helping to recycle the rubbish, for which the number of answers was 66%. On the other hand, 34% of them had some experiences of taking part in such events directly or indirectly. Within direct experiences, 54% of them belonged to conservation groups or were professional conservationists, hence only 46% of them had actually taken part in some events to do with environmental issues. Through free talking about environmental issues shown below (5), it was found that most respondents understood what had been going on the earth, and what they must have done, but the majority of respondents had not helped to save the environment so far. Their attitudes or intentions differed from their behaviour or actions completely. In other words there is an element of hypocrisy here. Hence it might be said that the education is vital, in addition to this more practical action to save the environment organised by a Government, NGOs
This question asked respondents to talk about environmental issues from any point of view. A variety of opinions was obtained from 59 visitors. 34% of them simply mentioned certain issues. Of these, the problem of oil fuel was mentioned quite a lot. It might relate directly to our everyday life such as too many cars and shortage of public transport; contaminated sea by oil; and need for alternative technology. Another 64% spoke of those issues but in addition elaborated on their opinions concerning them. Of these, "need individual awareness"; "Government responsibility" and "need more environmental education" dominated. It might be said that those 3 points are vital tasks for saving the environment. In addition, although a small number, some strong optimistic viewpoints were noticed which were probably caused by lack of knowledge of such issues.
Recollection studies are not common amongst museum studies and visitors studies. Arguably a main reason is that it is difficult to extract such information from visitors who visited a museum some months or years ago. However, if museums try to appeal to the public such as "our dying planet" through exhibitions, the results of how visitors made their life-style changes should be assessed and the results should be used for any future improvement of the exhibition. Needless to say, the names of individual visitors have not been recorded but some group visitors from schools and institutions have been stored in the museum's database. Hence it is felt to be a good idea to obtain some recollection data from them, and determine what longer term educational effects the exhibition might have had on teachers and pupils.

(A) METHOD

The visits made by school groups to the Ecology Exhibition in the NHM, London which took place between 6 and 18 months ago (a year± half a year) were those studied. The exact dates were from September 1992 to August 1993, and a "School Questionnaire" (see Appendix 24) was sent to each school in March 1994. According to the museum's database, the total number of groups which visited over those 12 months was 4885, and 516 groups (11%) visited the Ecology Exhibition. Within these, the number of groups with, pupils' ages over 14, was 196, which is the population for this study.

To begin with, 5 schools, which were judged to be likely willing respondents,
were chosen for the pilot study and a school questionnaire was sent with a letter from this researcher and a covering letter from this researcher's supervisor asking for response from the teacher and 4 pupils (preferably 2 girls and 2 boys), (see Appendix 21, 22) to each school. In the event, only 2 female teachers' and 4 male pupils' results were returned.

After having completed the pilot, 100 schools were randomly chosen for the main study and the same documents were sent to them. However the rate of return for this was under 50% including many letters of apology explaining that no response was due to pupils having left or because of teachers' retirement. Consequently, reminders were sent to the rest of the schools, and finally the rate of returning the questionnaire was 70%, comprising 39 teachers (16 males and 23 females) and 109 pupils (33 males and 76 females). In total 148 valid questionnaires were obtained. All their answers are shown in Appendix 26 (except for some invalid questionnaires which for example showed no details of sex, or teacher or pupil). After that, a letter of thanks was sent to all responding schools (see Appendix 23). The content of this school questionnaire is as follows.

CONTENT OF SCHOOL QUESTIONNAIRE

The questions consisted of 2 main groups. One asked about memorable things, and the other asked general questions relating to environmental education, exactly the same as the "Gallery Questionnaire" which was conducted in the Ecology Exhibition, in order to compare results. The School Questionnaire is inserted in Appendix 15.

QUESTION [1]

1. What do you remember about your visit to the Ecology Exhibition?
AIM: To determine which parts or elements of the Exhibition they remembered.

It was hoped that the results might show the affective impacts (episodic memory).

2. What did you learn from your visit?

AIM: To determine the educational impacts and in particular what influence it might have had on their lives (semantic memory).

3. In your opinion, does this Exhibition need to be improved? Why? In what way?

AIM: To obtain their ideas for the improvement of the Exhibition. The same questions were asked of visitors to the Ecology Exhibition, but in this case, the results might include some general ideas apart from the Exhibition due to visitors having forgotten the details of the Exhibition.

4. Have you any other observations to make about the experience?

AIM: Some good points and bad points would be obtained to reinforce the answers to question "3" above.

QUESTION [2]

This question asked (1) To what extent, whether they want to change their life-styles to help "Save the Earth"; (2) Whose future responsibility it is to "Save the Earth" asking them to choose from Government, employers, conservation groups and individual persons; and (3) If there was a very attractive exhibition on ecology describing "human impacts on the environment" whether they would go to see it. These questions are exactly the same as for the "Gallery Questionnaire". Hence both data will be subsequently compared.

(I) PILOT STUDY

RESULTS AND DISCUSSION

Expected number of questionnaire completed was 5 from teachers, 10 from male pupils and 10 from female pupils. However only 2 female teachers' and 4 male
pupils' questionnaires were returned and also some of the questions were not answered.

**QUESTION [1]**

Firstly, some of them remembered some large displays such as "Water Cycle", a video show using a "quadroscope" surrounded by mirrors. These were the most enjoyed sections by visitors to the Ecology Exhibition (see Fig 6.5, p312). Hence in the main study, this point will be focused upon.

Secondly only one answer of what they had learned from the Exhibition was obtained from a teacher who said "food chain". It was probably hard to answer this question because they had visited the Exhibition on average one year ago. However in the main study, the question will still be asked to broaden the results.

Thirdly some respondents said that no improvement of the Exhibition is necessary, but others suggested that it needs more information for "A" level (which is the preparation course to enter universities or similar institutions in the UK); there is not a lot about human impacts on the environment; reduce the number of computers; too crowded; and it must be extended. On the other hand, some respondents said they enjoyed it and it was very informative. In the main study, a wider range of answers will be obtained.

**QUESTION [2]**

Firstly, the answers of "to what extent, whether they want to change their life-styles to save the Earth" ranged from "3" to "5" on the scale of "1" (not at all) to "5" (a great deal). The results were very close to those for the "Gallery Questionnaire", hence in the main study, similar results are likely to be obtained. It showed that the changing life-style is not easy but it does
suggest that people do try to do this because the results were skewed to the right.

Secondly, the answers to "whose future responsibility it is to save the Earth" were concentrated on "Government" and "individual persons". The results were similar to those of the "Gallery Questionnaire" and in the main study, again similar results are likely to be obtained.

Lastly, the answers of "whether they want to go to see a very attractive exhibition describing human impacts on the environment" widely ranged on the scale from "1" (definitely no) to "5" (definitely yes) which was a wider spread than those for the "Gallery Questionnaire". On this question, respondents arguably might have answered the mailed questionnaire more honestly than in the gallery where there might have been a tendency for respondents that the interviewee felt that a negative response might have been hurtful to the interviewer. So perhaps the main study might generate a different pattern of results from those of "Gallery Questionnaire".

(C) MAIN STUDY

a) RESULTS AND DISCUSSION FOR QUESTION [1]

RESULTS

1. WHAT THEY REMEMBERED ABOUT THEIR VISIT TO THE ECOLOGY EXHIBITION.

This question asked teachers and pupils, who visited the Exhibition from 6 months to 18 months ago, if they were able to remember anything about the Exhibition. The results were that 59% of teachers and 70% of pupils were able to remember something, and 41% of teachers and 30% of pupils replied with very vague and superficial answers or they said they could not remember anything.
Of those who answered confidently in terms of their recollection of the Exhibition, 13% of them mixed up the Ecology Exhibition with other exhibitions in the NHM such as "Dinosaurs"; "Creepy-Crawlies" (insects); "Mammals" and "Human Biology". Of those with correct memories, the top three sections that were remembered were "Water Cycle", a video show using a large quadroscope (25%); "Rain Forest", a diorama (16%); "Leaf Factory", an enlarged diorama showing inside a leaf (10%), and "Earth Science", using smaller quadrosopes showing "Atmosphere", "Hydrosphere", "Lithosphere", and "Biosphere" (10%). Some clear answers relating to the top three are quoted below (Note: each second parenthesis is the respondent's number which is shown in Appendix 26. In addition, the following answers were directly transcribed from original questionnaires filled by respondents, hence these might include some grammatically incorrect sentences and spoken language).

*"Very impressive. Re-creation of rainforest very good and the audio-visual entrance hall (sun etc.) was spectacular and informative, as was water cycle. Exhibition on carbon cycle good also" (male teacher), (TM-2).

*"Rainforest - luxurant plant growth - lighting effects - sound of life; representation of the water cycle, marine environments; sun - dependence of life on light-energy - leaf factory; food webs; Human impact on the environment" (female teacher), (TF-12).

*"I can remember the big TV display which was surrounded by the mirrors and I thought that it was very impressive and informative" (male pupil), (PM-6).

*"I remember entering the exhibition to find firstly a rainforest exhibition where different animals can be heard. I also remember the different visual displays - some were made of television screens - one showing the earth,
others water. There were many displays with buttons to press, and some with phones so you could listen to animals calls. I also remember the leaf factory" (female pupils), (PF-5).

The results are shown graphically in figures 7.10 and 7.11 as follows.

**NUMBER OF PAST VISITORS (VISITED FROM 6 TO 18 MONTHS AGO) TO THE ECOLOGY EXHIBITION, THE NHM, WHO HAVE SOME MEMORIES.**

<table>
<thead>
<tr>
<th>REMEMBER</th>
<th>TM</th>
<th>TF</th>
<th>TOTAL (%)</th>
<th>PM</th>
<th>PF</th>
<th>TOTAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>10</td>
<td>13</td>
<td>23 59</td>
<td>22</td>
<td>54</td>
<td>76 70</td>
</tr>
<tr>
<td>VAGUE,NO</td>
<td>6</td>
<td>10</td>
<td>15 41</td>
<td>11</td>
<td>22</td>
<td>33 30</td>
</tr>
</tbody>
</table>

*TM: MALE TEACHER*  
*TF: FEMALE TEACHER*  
*PM: MALE PUPIL*  
*PF: FEMALE PUPIL*  

There are limited differences in responses between sexes, and pupils and teachers.

*(NOTE: Of those pupils who answered confidentially in terms of their recollection of the Ecology Exhibition, 13% of them mixed up the Ecology Exhibition with other exhibitions in the NHM.)*

**CONTENTS OF CLEAR MEMORY BY PAST VISITORS (VISITED FROM 6 TO 18 MONTHS AGO) TO THE ECOLOGY EXHIBITION, THE NHM**

<table>
<thead>
<tr>
<th>NO.</th>
<th>EXHIBITS</th>
<th>TEACHER (%)</th>
<th>PUPIL (%)</th>
<th>TOTAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WATER CYCLE</td>
<td>14</td>
<td>19</td>
<td>34 28</td>
</tr>
<tr>
<td>2</td>
<td>RAINFOREST</td>
<td>9</td>
<td>12</td>
<td>22 18</td>
</tr>
<tr>
<td></td>
<td>LEAF FACTORY</td>
<td>9</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
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<td>----</td>
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</tr>
<tr>
<td>3</td>
<td>EARTH SCIENCE</td>
<td>8</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>HUMAN IMPACTS</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>WEB &amp; THECHAIN</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>A RABBIT’S LIFE</td>
<td>7</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>TVS</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>ECOSYSTEMS</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>SUN’S ENERGY</td>
<td>5</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>TOUCH SCREENS</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>POPULATION BALANCE</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>ALL OTHERS</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>---</td>
<td>---------------</td>
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<td>----</td>
<td>----</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>75</td>
<td>100</td>
<td>120</td>
</tr>
</tbody>
</table>

*1: EARTH SCIENCE USING SOME QUADROSCOPES
*2: ECOSYSTEMS - STUFFED ANIMALS AND A DIORAMA OF AN AFRICAN SABANNA WITH PEEP SLITS

**EXHIBIT**

---

**EPISODIC MEMORY**

---

**EXHIBIT**
2. WHAT THEY LEARNT FROM THEIR VISIT

This question asked teachers and pupils what they learnt from their visit. The results can be divided into 4, from "A" to "D". "A" is "some ecological knowledge". The answers were varied, and they probably included some knowledge from other sources. Hence it is dangerous to classify each item as an educational effect directly caused by visiting the Ecology Exhibition. Consequently, only the total number of those respondents can be counted. "B" is "not a lot" or "no"; "C" is "enhanced their previous knowledge"; and "D" is "others". The results showed that 23% of teachers said they obtained some ecological knowledge (A), however 58% for pupils. On the other hand, 64% of teachers said they did not obtain new information very much or did not at all, but those answers by pupils were 25%. The statistical difference between teachers and pupils was therefore significant at the 5% level (df=3, $z^2 = 21.85$, p<0.005), however sex differences were not significant for pupils (NOTE: each number of teachers' data, males' and females', were under 30, which is not enough to examine this study). Some clear answers relate to both "A" (some ecological knowledge) and "B" ("not a lot" or "no") are quoted as follows.

* "As a teacher, I don't think I learnt anything completely new, though I found the displays gave a vivid illustration of what I already understood in an academic way" (male teacher), (TM-3).

* "Probably not much more than I already knew - but the way it was organised was good and a learning experience" (female teacher), (TF-7).

* "I learnt a lot about ecology and how ecosystems work" (male pupil), (PM-17).

* "I learnt lots - carbon cycle; water cycle; nitrogen cycle; fluctuating populations which plants, animals are useful to man for medicine etc.; about different environments, weather, wildlife and vegetation" (female pupil), (PF-6).
The results are shown graphically in Figure 7.12 as follows.

**RECOLLECTION OF WHAT VISITORS LEARNT FROM THE ECOLOGY EXHIBITION**

_IN THE NRM, ANSWERED BY SCHOOL GROUPS, VISITED FROM 6 TO 18 MONTHS AGO_

J. H. IGUCHI 1994

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>TOTAL</th>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM</td>
<td>4</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>16</td>
<td>PM</td>
<td>21</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>TF</td>
<td>5</td>
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<td>PF</td>
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</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>9</td>
<td>25</td>
<td>2</td>
<td>3</td>
<td>TOTAL</td>
<td>63</td>
<td>27</td>
<td>14</td>
<td>5</td>
<td>109</td>
</tr>
<tr>
<td>(%)</td>
<td>23</td>
<td>64</td>
<td>5</td>
<td>8</td>
<td>100</td>
<td>(%)</td>
<td>58</td>
<td>25</td>
<td>13</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

TM: male teacher, TF: female teacher, PM: male pupil, PF: female pupil

A: some ecological knowledge
B: not a lot, or no
C: enhanced my knowledge
D: all others

The sex difference for pupils is not significant (Note: there was not enough teachers' data to justify the results of this test because of under 30 each).

The statistical difference between teachers and pupils is significant at the 5% level (df=3, \(z^2=21.85\), \(p<0.005\)
3. THE EXHIBITION NEEDS TO BE IMPROVED OR NOT

Although it had been over a year since respondents visited the Ecology Exhibition, this question tried to investigate visitors' recollections in terms of their opinions concerning possible improvements to the Ecology Exhibition. The results showed that 26% of teachers said "no, need not" and 67% of them answered "yes". However pupils' answers for "no" and "yes" were nearly fifty-fifty ("no": 45%, "yes": 55%). Consequently, the statistical difference between teachers and pupils is significant at the 5% level (df=2, $\chi^2 = 11.75, p<0.005$).

The teachers' and pupils' opinions for improvement of the Exhibition were varied. The top three of them were: "more interactive" such as "hands on" (13%); "more information" especially for "A" level (12%); "need some teaching materials" for both teachers and pupils (11%); and "more realistic" showing practical issues or using real organisms (11%). Some clear comments are shown as follows.

* "Better support materials for pupils to use. We devised our own, but worksheets from the museum might have helped. More "hands-on" activities?" (male teacher), (TM-4).

* "More back-up for the exhibition e.g. preparation materials prior to visit and an interactive pack suited to different abilities/ages to be used whilst visiting the exhibition. This could be made fun for younger children e.g. quiz/questionnaire/game and include a section for follow-up work to be done when back to school/college...." (female teacher), (TF-3).

* "More interaction. The Exhibition was not appealing. Should be improved to be more like human physiology part of the Natural History Museum which is very interesting" (male pupil), (PM-B). (Note: a human physiology exhibition in the NHM called "Human Biology" has many interactive displays.)
"At the end of the exhibition, I think, it is the last exhibit is a video on man's impact on the environment. It is very good but I felt not everyone would stop to watch the whole show - there should be greater emphasis at the end on the effect man has - conclusion to the exhibition should be more emphasized" (female pupil), (PF-1).

4. IF THEY HAD ANY OTHER OBSERVATIONS TO MAKE ABOUT THE EXPERIENCE

The results of question 4, asking "if they have any other observations to make about the experience", showed that although the rate of reply was 43% (64 persons out of 148), 72% (46 persons) of them praised the Exhibition, and 28% (18 persons) complained. Some clear comments are quoted as follows.

*"The images reflected in the "water cycle" sphere are wonderful and also the aesthetic sense of the whole exhibition", (female teacher), (TF-6).

*"The video walls about the lithosphere, biosphere, atmosphere and hydrosphere were great, particularly the one on the sun, I stared at it for 10 minutes" (male pupil), (PM-4).

*"It was well organised. You could never turn back and you got to see everything and you had no excuse to say you missed anything because it was all in order" (female pupil), (PF-7).

*I think all children should visit the museum especially if they are studying science" (female pupil), (PF-17).

*"Superbly displayed and captured my interest at the time, since my visit I have recommended this exhibit to friends who are going to visit the museum" (female pupil), (PF-32).

*"We should go there often to learn more about our bad behaviour towards nature" (female pupil), (PF-51).

These results are shown graphically in figures 7.13 and 7.14 as follows.
ECOLOGY EXHIBITION IN THE NHM NEEDS TO BE IMPROVED OR NOT, ANSWERED BY PAST VISITORS, VISITED FROM 6 TO 18 MONTHS AGO

<table>
<thead>
<tr>
<th></th>
<th>NO</th>
<th>YES</th>
<th>NO MEMORY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHERS (%)</td>
<td>10</td>
<td>26</td>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>67</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>PUPILS (%)</td>
<td>49</td>
<td>60</td>
<td>0</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>45</td>
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</tr>
<tr>
<td>TOTAL (%)</td>
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<td>3</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>58</td>
<td>2</td>
<td>100</td>
</tr>
</tbody>
</table>

The statistical difference between teachers and pupils is significant at the 5% level (df=2, $\chi^2=11.75$, p<0.005)

ITEMS WHICH THE ECOLOGY EXHIBITION IN THE NHM NEEDS TO BE IMPROVED, ANSWERED BY PAST VISITORS, VISITED FROM 6 TO 18 MONTHS AGO

<table>
<thead>
<tr>
<th>ANSWERS</th>
<th>NUMBER</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A MORE INTERACTIVE</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>B MORE INFORMATION</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Number</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>C</td>
<td>Need teaching materials</td>
<td>13</td>
</tr>
<tr>
<td>D</td>
<td>More realistic</td>
<td>12</td>
</tr>
<tr>
<td>E</td>
<td>For younger children</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>More effective</td>
<td>7</td>
</tr>
<tr>
<td>G</td>
<td>Less information</td>
<td>8</td>
</tr>
<tr>
<td>H</td>
<td>To be extended</td>
<td>5</td>
</tr>
<tr>
<td>I</td>
<td>Boring</td>
<td>5</td>
</tr>
<tr>
<td>J</td>
<td>Stress on human impacts</td>
<td>3</td>
</tr>
<tr>
<td>K</td>
<td>Cannot remember</td>
<td>3</td>
</tr>
<tr>
<td>L</td>
<td>Mend out of order sections</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>For handicapped</td>
<td>3</td>
</tr>
<tr>
<td>N</td>
<td>All others</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>114</td>
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</tbody>
</table>
DISCUSSION

As mentioned above, 3 main questions were asked to past visitors, teachers and pupils, and a good deal of information was obtained although they visited the Ecology Exhibition around one year ago. Some discussion on each question are as follows.

1) What they remember about their visit

Nearly 60% of teachers and 70% of pupils could remember some parts of the Exhibition. The items they recalled were varied and 13% of those pupils mixed up the Ecology Exhibition with other exhibitions in the NHM. The top 3 of the items remembered correctly were "Water cycle"; "Rainforest"; and "Leaf Factory", and they were interestingly exactly the same as the top 3 of the most enjoyed sections which were obtained from the "Gallery Questionnaire" (see Fig 6.5, p312). A characteristic common to all 3 sections was AV effects, especially visual and sound effects with an experience of walking through in the diorama (rainforest); seeing an enlarged inside system of a leaf (leaf factory); and faced with a huge quadroscope surrounding by mirrors showing a short video called "Water Cycle". Consequently it can be said that those of sections are
the most successful exhibits as far as helping visitors to recall their visit.

2) What they learnt from their visit

The answers were varied and might have included some prior knowledge of ecology obtained from other sources. If so, it is dangerous to classify those items answered. Hence only the number of respondents who obtained some ecological knowledge has been counted. A remarkable aspect of these results was that only 23% of teachers obtained some new ecological information, and 64% of them did not gain any or not a lot. However, on the other hand, 58% of pupils benefited from the Exhibition, and only 25% said they had not. The statistical difference between teachers and pupils was significant at the 5% level (p<0.005). The main reason was that the conceptual level of the Exhibition was too low for teachers, the majority of whom already had reasonable understanding of ecology. However, even pupils argued for more high level information.

3) The exhibition needs to be improved or not

This question might have been the hardest to answer of the 3 questions for respondents because their memories of the Exhibition might not have been clear. Hence the answers might include some general ideas of what they wanted. However all ideas offered were accepted for analysis.

Firstly the results showed that 58% of respondents said "yes, it needs to be improved" and 40% of them said "not necessary". The statistical difference between teachers and pupils was significant at the 5% level (p<0.005), because the number of the teachers' answer "no" (26%) was lower than pupils' (45%), and on the other hand, the number of the teachers' answer "yes" (67%) was higher than pupils' (55%). According to the returned questionnaires, the main reason for this might be that teachers were more critical because of their higher knowledge base. Hence it is a good idea to ensure that exhibitions meet the needs of
Secondly, the top 3 items mentioned by school groups as needing to be improved were different to the results of the "Gallery Questionnaire" which was filled in by general visitors (see Fig 6.15, p333). The top 3 answers for general visitors were "stress on human impacts"; "for young children"; and "to be extended". The reason for these answers might be that "human impacts on the environment" is a big issue for all of us in our everyday life these days, and also people wanted their own children to be educated and to find enjoyment for them as well. On the other hand, the top 3 answers for school groups were "more interactive"; "more information"; and "need teaching materials". Perhaps they felt that human impacts should be a big theme for ecology exhibitions, but that they needed a wide variety of information to reinforce their school work, and at the same time wanted enjoyment through more interactive exhibits. This is significant data which can be used for the improvement not only of the Ecology Exhibition but also for similar types of exhibition.

b) RESULTS AND DISCUSSION FOR QUESTION [2]

RESULTS

1. The extent to which people want to change their life-styles to help "Save the Earth"

The results ranged from "1" (not at all) to "5" (a great deal), and no statistical difference between sexes of pupils was identified (Note: there was not enough teachers’data to justify a difference between sexes because of under 30 each – see p143). Also between teachers and pupils, the statistical difference was not significant at the 5% level (df=4; \( z^2 =5.44; p>0.1 \)). The "mode" was "4", and the "mean" was "3.7", hence the distribution was slightly positive skewed. In addition, the results of the test of difference between
the "School Questionnaire" and the "Gallery Questionnaire" (see p365) were not significant at the 5% level (df=4; \( x^2 = 7.91; 0.1 > p > 0.05 \)). The results are shown graphically in figure 7.15 as follows.

### TEACHERS' AND PUPILS' INTENTION TO CHANGE THEIR LIFE-styles TO SAVE THE EARTH IN THE UK

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>TOTAL</th>
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<tr>
<td><strong>MALE TEACHERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(%)</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td><strong>FEMALE TEACHERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(%)</td>
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<td>4</td>
<td>13</td>
<td>54</td>
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<td>100</td>
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<td><strong>TOTAL</strong></td>
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<tr>
<td>(%)</td>
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<td>4</td>
<td>15</td>
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<td>38</td>
<td>100</td>
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<td><strong>MALE PUPILS</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>(%)</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>12</td>
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<td><strong>FEMALE PUPILS</strong></td>
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<td>(%)</td>
<td>3</td>
<td>9</td>
<td>38</td>
<td>38</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(%)</td>
<td>1</td>
<td>6</td>
<td>41</td>
<td>50</td>
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<td>111</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>(%)</td>
<td>1</td>
<td>6</td>
<td>50</td>
<td>63</td>
<td>26</td>
<td>149</td>
</tr>
</tbody>
</table>

1: Not at all  
5: A great deal

**MODE:** 4; **MEAN:** 3.7

**TESTS OF DIFFERENCE**  
(at the 5% level)

*Between sexes for pupils:*
not significant  
(Note: there was insufficient teachers' data, that is under 30 each, to test it.)

*Between teachers and pupils:*
not significant  
(\( x^2 = 5.44; df=4; p>0.1 \)).

*Between the results of "School Questionnaire" and "Gallery Questionnaire":*
not significant  
(\( x^2 = 7.91; df=4; 0.1 > p > 0.05 \)).
2. Whose future responsibility it is to "save the Earth"

As a rule, respondents had to choose only one from "Government"; "employers"; "conservation groups"; and "individual persons". However plural answers were counted, because it was probably difficult for some persons to choose only one category. The statistical difference between sexes for pupils was not significant (Note: there was insufficient teachers'data, that is under 30 each, to justify the results of this test). However the differences between views of teachers and pupils were considerable. For instance, 43% of teachers chose "Government" and 39% said "individual persons" (Mode:Government), but 27% of pupils chose "Government" and 70% said "individual persons" (Mode:individual persons). Therefore, the statistical difference between them was significant at the 5% level (df=3; \( \chi^2 = 19.52; p<0.005 \)). Although the statistical difference between responses of the pupils and general visitors to the Ecology Exhibition (see p366) was not significant, between teachers and general visitors, the difference was significant at the 5% level (df=3; \( \chi^2 = 10.78; 0.05>p>0.01 \)). All these results are shown in figures 7.16 and 7.17 as follows.
Whose future responsibility it is to save the Earth, answered by teachers and pupils in the UK

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALE TEACHERS (x%)</strong></td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>13</td>
<td>13</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td><strong>FEMALE TEACHERS (x%)</strong></td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>8</td>
<td>4</td>
<td>44</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL (x%)</strong></td>
<td>21</td>
<td>5</td>
<td>4</td>
<td>19</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>10</td>
<td>8</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

1: GOVERNMENT
2: EMPLOYERS
3: CONSERVATION GROUPS
4: INDIVIDUAL PERSONS

MODE (TEACHERS): GOVERNMENT
MODE (PUPILS): INDIVIDUAL PERSONS

*The statistical difference between sexes for pupils is not significant (Note: there was insufficient teachers' data, that is under 30 each, to justify the results of this test).

*The statistical difference between teachers and pupils is significant at the 5% level (df=3, $\chi^2 = 19.52$, p<0.005).
The statistical difference between teachers and general visitors is significant at the 5% level (df=3, \( \chi^2 = 10.78 \), 0.05<p<0.01).
3. If there was a very attractive exhibition on ecology describing "human impacts on the environment", whether they would go to see it

The question asked the respondents to choose only one from "1" (definitely no) to "5" (definitely yes).

Firstly, the statistical difference between sexes for pupil was significant at the 5% level, that is males' mode was "5", but females' mode was "3" (df=4, $\chi^2 = 10.53$; 0.05 $> p > 0.025$). Although the sex difference between teachers could not be calculated giving the small amount of data (under 30 each), the mode for each sex was "5", and they were very similar.

Secondly, the statistical difference between teachers and pupils was also significant at the 5% level. The teachers' mode was "5" and the "mean" was 4.5, however pupils' mode was "3" and the "mean" was "3.8" (df=4, $\chi^2 = 21.39$, $p < 0.01$).

Thirdly, the statistical difference between teachers and general visitors to the Ecology Exhibition was not significant, yet between pupils and those general visitors, it was significant at the 5% level (df=4, $\chi^2 = 9.7$, $p < 0.05$).

All these results are shown graphically in figures 7.18 and 7.19 as follows.
**TEACHERS AND PUPILS' INTEREST IN VISITING A VERY ATTRACTIVE ECOLOGY EXHIBITION, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT" (THE UK)**

J. H. IGUCHI 1994

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALE TEACHERS (X)</strong></td>
<td></td>
<td></td>
<td></td>
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<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>10</td>
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</tr>
<tr>
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<td>7</td>
<td>20</td>
<td>66</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>FEMALE TEACHERS (X)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>1</td>
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<td>3</td>
<td>16</td>
<td>23</td>
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</tr>
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<td>0</td>
<td>4</td>
<td>13</td>
<td>13</td>
<td>70</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL (X)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>26</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>11</td>
<td>16</td>
<td>68</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

1: Definitely no  
5: Definitely yes

**<TEACHERS>**  
MODE:5; MEAN:4.5  
*The statistical difference between sexes cannot be made owing to a shortage of data (under 30 each).

**<PUPILS>**  
MODE:3; MEAN:3.8  
*The statistical difference between sexes is significant at the 5% level (df=4, \( \chi^2 = 10.53 \) \( 0.05>p>0.025 \)).

**<TEACHERS AND PUPILS>**  
*The statistical difference is significant at the 5% level (df=4, \( \chi^2 = 21.39 \), \( p<0.01 \)).
DIFFERENCE BETWEEN GENERAL VISITORS TO THE ECOLOGY EXHIBITION IN THE NIM AND PUPILS IN THE UK IN TERMS OF THEIR INTEREST IN VISITING A VERY ATTRACTIVE ECOLOGY EXHIBITION, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT"

Fig 7.19

J. H. IGUCHI 1994

1: Definitely no
5: Definitely yes

$df=4; \chi^2 = 9.7$
$p < 0.05$;

significant at
the $5\%$ level

SEMANTIC DIFFERENTIAL
DISCUSSION

These three questions are exactly the same as certain elements of the "Gallery Questionnaire", yet the answers to some questions differ from the gallery study. These are discussed below.

1. The extent to which people want to change their life-styles to help "save the earth"

No statistical differences were observed between sexes (Note: teachers' are not available because the population was under 30 each); teachers and pupils; and all those results and gallery study. The mode was "4" on the scale of from "1" (not at all) to "5" (a great deal) and the "mean" was 3.7 that is the distribution was slightly positive skewed. These results are similar to those of the gallery study. This is probably because changing life-style even partly is not easy. However the distribution of the data was positively skewed. Hence it can be said that people are becoming more aware of environmental problems since they see them as affecting themselves directly. The same question will be asked to the general public in London in the next section.

2. Whose future responsibility it is to save the earth

There are two significant results in terms of the statistical difference. Firstly, 43% of teachers said "Government" and 39% answered "individual persons", however in the pupils' case, the number of "Government" chosen was 27% and 70% said "individual persons". The statistical difference between teachers and pupils is significant at the 5% level (p<0.005). Secondly, a test of difference between teachers and general visitors to the Ecology Exhibition was also significant at the 5% level (0.05>p>0.01).
From these results, it can be seen that teachers seem to depend on the Government to solve the issues because they perceive that the Government can regulate the contamination of the earth for example. However most pupils and general visitors thought that individual efforts are the first priority for saving the earth. Although some of them said they could not choose only one from "Government"; "employers"; "conservation groups"; and "individual groups", the main tendency of the answers were as mentioned above. The same question will be asked to general pedestrians in London in the next section.

3. If there was a very attractive exhibition on ecology describing "human impacts on the environment", whether people would go to see it

This question is both a hypothetical and leading question using the words "if" and "very attractive exhibition", which were used intentionally to get higher positive results (see p361). Through analysing the results, 3 significantly statistical differences were discovered.

Firstly, male pupils' mode was "5" on the scale of from "1" (definitely no) to "5" (definitely yes), however females' mode was "3", and the statistical difference between them was significant at the 5% level (0.05>p>0.025). Consequently the mode of pupils was "3" and the distribution was positively skewed. Secondly, the mode of the teachers' results was "5" ("definitely yes" - 68%). Hence again the difference between pupils and teachers was statistically significant at the 5% level (p<0.01). Thirdly and similarly the difference between pupils and general visitors to the Ecology Exhibition was also statistically significant at the 5% level (p<0.01).

From these results it can be seen that teachers are the most likely to go to see such exhibitions; the second group would be general visitors to the Ecology
Exhibition; and the third group would be pupils. Within the pupils, males appear more interested in such exhibits than females. All in all, pupils seem less interested in such exhibits than other groups. Hence the results might be useful in order to create educationally effective ecology exhibitions for schools, regarding to both affective and cognitive effects. In addition, the same question will be asked to general pedestrians in London in the next section.
[3] STREET INTERVIEWS ON ECOLOGY

Earlier in this chapter the focus was on visitors to the Ecology Exhibition in terms of their responses to this Exhibition and their general ecological awareness. However this section will investigate the general public so as to compare this data with the previous results. Hence, all these studies might help, through their findings, to educate the general public in environmental education through museums.

[A] METHOD

The interviews were conducted from 4th to 8th February 1994 (5 days), mainly in popular and famous parks in the centre of London, that is Regent's Park; Hyde Park; Green Park; St James's Park; and around Big Ben (Parliament area). The reasons for the choice of those parks for the interviews are that (1) parks are relatively quiet; (2) people in the parks might have time to be interviewed; (3) wide variety of types kinds of respondents from across the world might agree to be interviewed. As a result, 102 respondents were randomly selected across sex and age that is: teenagers; young adults; middle-aged; and elderly. This researcher made an estimate of their ages.

As regards street interviews, the method of random selection is different from others in the museums, because people in the streets have a variety of reasons for being there. Hence the method used was:

1. A random selection was made within each previously planned number of males, females and age groups (see p209) avoiding where possible any bias that the researcher might bring to the selection process. However the people who, in the researcher's view, seem unlikely to agree to an interview were not
asked.

2. In order to get agreement to an interview, this researcher explained to pedestrians that "it takes only a few minutes". In addition, he did not ask the pedestrians whether the interview could be recorded (to avoid their refusing), but a small tie pin type of microphone was used at the start of the process in order to avoid putting undue pressure on respondents. As a result, no respondents complained of using it.

The content of the interviews were as follows.

THE INTERVIEW

1. MEANING OF "ECOLOGY"

The same question was asked to the visitors to the Ecology Exhibition in the NHM as a part of "Ecology Quiz" (see p353). Respondents could choose a right answer from the answer column which showed four similar answers.

AIM: To determine the level of the general public's knowledge about the term "ecology" in general, and to compare these results with those of visitors to the Ecology Exhibition, which were conducted for the "Ecology Quiz" undertaken by this author.

2. FAMILIAR TECHNICAL TERMS OF ENVIRONMENTAL ISSUES

Similar questions were asked to the visitors in the Ecology Exhibition as a part of "Gallery Interview", however, in this case, this study wanted to ask about some familiar technical terms on environmental issues only to the general public, since it was felt that few people would be prepared to discuss these issues in detail whilst in the street and most likely in a hurry.

AIM: To determine the level of the general public's knowledge of environmental issues.
3. WHETHER THEY HAD TAKEN PART IN ANY EVENTS ON ENVIRONMENTAL ISSUES

The same question was asked to the visitors to the Ecology Exhibition in the NHM as a part of "Gallery Questionnaire" (see pp368-370).

**AIM:** To determine the degree of the general public's practical actions to "Save the Earth", and compare these results with those of the gallery study.

The following 3 questions for street interviews were already asked to visitors to the Ecology Exhibition by "Gallery Questionnaire" and teachers and pupils by mailed "School Questionnaire" (see pp360,361, describing the aims in detail), and all results will be compared with each other.

4. TO WHAT EXTENT WHETHER THEY ARE PREPARED TO CHANGE THEIR LIFE-STYLES TO HELP "SAVE THE EARTH"

**AIM:** To determine how the general public feel about environmental issues.

5. WHOSE FUTURE RESPONSIBILITY IT IS TO "SAVE THE EARTH"

**AIM:** To ascertain the group considered most responsible as well as the extent of responsibility at an individual level.

6. IF THERE WAS A VERY ATTRACTIVE EXHIBITION ON ECOLOGY, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT" WHETHER THEY WOULD GO TO SEE IT

**AIM:** To determine the degree of interest in exhibitions and environmental issues. As already mentioned, this is a leading and hypothetical question which generally should be avoided (see p145). However it was hoped that responses might be generally positive to encourage the future implementations of such exhibitions (see also p361).

Finally the educational background and nationality of each respondent was asked about.
PILOT STUDY

The pilot study was conducted on 4th February 1994 in Regent's Park, London. The number of respondents was 9 (4 males and 5 females), and the range of ages was teenager to elderly. The respondents' nationalities were 7-British; one American; and one Iranian. Although only 9 pedestrians were asked, two of them were from other countries, hence in the main study, it is expected that interviewees from a variety of nationalities would be surveyed. The brief results and discussions are as follows.

RESULTS AND DISCUSSION (PILOT)

Firstly the number of the correct answers to the "meaning of ecology" was only 2, and 7 respondents chose wrong answers. In the main study, a similar lower correct score might be expected.

Secondly a variety of terminology on environmental issues were reported. Within them, some respondents said just "pollution" or "air or water pollution". However these terms are rather general and fail to discriminate between levels of environmental awareness and so they were not included in the analysis. Within others, most frequently reported terms were: "rainforest"; "greenhouse effect"; "ozone layer"; and "nuclear power". Most people said just "rainforest" which means the "destruction of rainforests". The term "rainforest" in addition might have begun to represent a negative set of images nowadays as opposed to the positive and beautiful former images that the term had. These 4 terms are very big issues, so in the main study, they might be prominent.

Thirdly, only 2 respondents had experiences of taking part in events on environmental issues, and 7 had not. Hence in the main study, it might not be expected to obtain many these experiences.

Fourthly, the answers for "to what extent whether they prepare to change
their life-styles to help Save the Earth" ranged from "3" to "5" on the scale of "1" (not at all) to "5" (a great deal). This pattern is very close to previous studies, "Gallery Interview" and "School Questionnaire". Hence the results of the main study might show a similar pattern.

Fifthly, the answers for "whose future responsibility it is to save the earth" concentrated on "Government" and "individual persons" which was close to the results of previous studies as well. Hence in the main study, similar results might be obtained, and the study will be focused on which category is most often chosen.

Lastly (the 6th question), the answers of "if there was a very attractive exhibition on ecology describing human impacts, whether they would go to see it" also varied from "3" to "5" on the scale of "1" (definitely no) to "5" (definitely yes) as similar to previous studies. Hence in the main study also similar results might be obtained.

(C) MAIN STUDY

(a) METHOD AND PROFILES OF RESPONDENTS

The main study was conducted from Saturday 5th to Tuesday 8th February 1994, in 4 major parks: Regent's Park, Green Park, St James's Park, Hyde Park, and around the Big Ben area of central London. 102 pedestrians, 47 males and 55 females, agreed to be interviewed. As shown in figure 7.20, the rate of acceptance was 60% (102 pedestrians) and 68 pedestrians refused. The educational backgrounds of respondents are shown in figure 7.21, and suggests they were unexpectedly slightly more educated than visitors to the Ecology Exhibition in the NHM (see figure 7.2: p350). In addition, 59 respondents were British, and of the others: 8 were Americans; 6-Japanese; 3-Italian; 2-British-American (dual nationality); 2-Irish; 2-Canadian; 2-Germany; 2-Spanish. The other 16 respondents were from a
variety of countries. They were Danish; Dutch; Swiss; Swedish; Georgian; Greek; Lebanese; Persian; Turkish; Australian; New Zealander; South African; Indian; Chinese; Chinese-Philippian (dual nationality). Hence although respondents from countries outside the UK were individually small, their aggregate results might be more representative of an international level of tendency of environmental awareness.

In addition, although there was not as much conversation as there was for the "Gallery Interview", all transcripts from recorded tapes are shown in Appendix 27.

RATE OF ACCEPTANCE FOR STREET INTERVIEWS IN PARKS, LONDON Fig 7.20

<table>
<thead>
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<th>CATEGORY</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO EDUCATION</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>UP TO 16</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>UP TO 18</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>FIRST DEGREE</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>HIGHER DEGREE</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>102</td>
<td>100</td>
</tr>
</tbody>
</table>

PEDESTRIANS’ EDUCATIONAL BACKGROUNDS IN LONDON Fig 7.21

J. H. IGUCHI 1994
b) RESULTS

1. What does ecology mean?

Respondents could choose the most pertinent answer from 4 similar answers, and 43% of males and 55% of females chose the right answer. The overall rate of correct answers was 49% and this was lower than the result of the "Ecology Quiz" (72%) which asked the same question to visitors in the Ecology Exhibition. The results are tabulated in figure 7.22 as follows.

<table>
<thead>
<tr>
<th></th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>20/47(TOTAL)</td>
<td>30/55(TOTAL)</td>
<td>50/102(TOTAL)</td>
</tr>
<tr>
<td>%</td>
<td>43</td>
<td>55</td>
<td>49</td>
</tr>
</tbody>
</table>

Fig 7.22

NOTE: the most pertinent answer for meaning of "ecology" in general within 4 similar answers is "the study of the relationships between living organisms and their physical environment".

2. Could you list some environmental issues?

Although very limited time was spent on each interview, 273 answers were obtained. Within them, 21% (58 answers) were "pollution" and "air or water pollution". These terms were not included in the data to be analysed because their meanings were too wide. Within accepted terms or issues, the top 5 were: ozone layer (depletion or hole) (17%); gases from cars and factories, and passive smoking (12%); deforestation (disappearing rainforests) (11%); loss of habitats and endangered species (11%); and greenhouse effect (global warming), (8%). All these results are shown graphically in figure 7.23 as follows.
<table>
<thead>
<tr>
<th>RANK</th>
<th>ISSUES</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ozone layer (depletion)</td>
<td>37</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>Gases from cars &amp; factories, and passive smoking</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Deforestation (disappearing rainforests)</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Loss of habitats/endangered species</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Greenhouse effect (global warming)</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Overpopulation</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Radioactivity from nuclear power stations &amp; domestic electrical instruments</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Rubbish tipping &amp; land filling</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Land development/urbanisation</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Chemical plants &amp; waste</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Whaling</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Acid rain</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Oil spillage in the sea</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Intensive farming with chemical &amp; tree farming</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Battery farming/overgrazing/exporting live animals</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Famine/drought/deserts</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Natural resources going to run out</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Dams/power stations/power lines (caused cancer)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Conservation of land (land pollution)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Over fishing</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>
3. Have you ever taken part in any events on environmental issues?

This question asked pedestrians if they had ever taken part in such events. The results were that 73% of them had no experience; 25% had directly; and 2% had indirectly. There was no statistical differences between sexes, and between these results and the "Gallery Interview" with visitors in the Ecology Exhibition at the 5% level (df=2, $\chi^2 = 4.9$, $0.1 > p > 0.05$). Within respondents who had the experience, there were one biology teacher, and 4 members of NGOs: FoE (Friends of the Earth); Sierra Club (USA); WWF (World Wide Fund for Nature); and others. Indirect experiences were to attend some courses, and direct experiences were: recycling (8); rally (5); and others included attending conferences/signing a petition/cleaning up a town/collecting money for FoE/
saving animals. Some particularly clear answers are quoted below (Note: the number in a parenthesis is the order of the interview which is shown in Appendix 27 with the full-transcript; "Ed" means educational background. In addition, the transcription comes directly from original tapes recorded, hence it might include some grammatically incorrect sentences and slang).

*"Against fox hunting. Natural Trust is interested in preserving historical things, and I am a rambler" (British-American male in his late twenties), (Ed:Higher degree), (No.3).

*"Yes...I was in the organising committee of the Eurochannel of Commerce and Industry which organised a major conference with 2,500 participants on environmental issues in June 1992 in Geneva" (Swiss male in his late fifties), (Ed:Master in law), (No.37).

*"Cleaning up the parks in New York City, picking up litter ...supported Greenpeace" (American male in his early twenties), (Ed:Bsc), (No.53).

*"Yes...rally in Cheltenham about dumping toxic waste nearby and a Greenpeace rally in London" (British male in his teens), (Ed:up to 18), (No.83).

*"Yes...collected money for Friends of the Earth" (British female in her twenties), (Ed:MA), (No.10).

*"I belong to various organisations...I went on a demonstration outside the American Embassy" (British female in her late fifties), (Ed:1st degree), (No.32).

The results are shown graphically in figure 7.24 as follows.
**Whether pedestrians in London had taken part in any events to do with environmental issues**

<table>
<thead>
<tr>
<th></th>
<th>NO</th>
<th>INDIRECT</th>
<th>YES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALE</strong></td>
<td>36</td>
<td>1</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>(%</td>
<td>77</td>
<td>2</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td><strong>FEMALE</strong></td>
<td>38</td>
<td>1</td>
<td>16</td>
<td>55</td>
</tr>
<tr>
<td>(%</td>
<td>69</td>
<td>2</td>
<td>29</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>74</td>
<td>2</td>
<td>26</td>
<td>102</td>
</tr>
<tr>
<td>(%</td>
<td>73</td>
<td>2</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

No statistical difference between sexes at the 5% level (df=2, $\chi^2=0.83$, $p>0.1$)

No statistical difference between these results and the Gallery Interview with the visitors in the Ecology Exhibition at the 5% level (df=2, $\chi^2=4.9$, 0.1$p>0.05$).
4. To what extent are you prepared to change your life-style to help "Save the Earth"?

Respondents could choose simply one from "1" (not at all) to "5" (a great deal). The results were split nearly equally from "3" to "5", that is, "3" was 37%; "4" was 29%; and "5" was 31%, and the "mean" was "3.9". There was no significantly statistical difference between sexes at the 5% level. However the significance was shown between these results and the "Gallery Questionnaire" (df=4, $z^2 = 11.85$, 0.05 $p > 0.01$), and the "School Questionnaire" (df=4, $z^2 = 12.14$, 0.05 $p > 0.01$). The mode of the total of these 3 studies was "3", and the "mean" was 3.7. All these results are shown graphically in figures 7.25 and 7.26 as follows.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>MALE</td>
<td></td>
<td></td>
<td>20</td>
<td>12</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td>(%)</td>
<td>2</td>
<td>2</td>
<td>43</td>
<td>25</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>FEMALE</td>
<td></td>
<td></td>
<td>18</td>
<td>17</td>
<td>19</td>
<td>55</td>
</tr>
<tr>
<td>(%)</td>
<td>0</td>
<td>2</td>
<td>33</td>
<td>31</td>
<td>34</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>38</td>
<td>29</td>
<td>32</td>
<td>102</td>
</tr>
<tr>
<td>(%)</td>
<td>1</td>
<td>2</td>
<td>37</td>
<td>29</td>
<td>31</td>
<td>100</td>
</tr>
</tbody>
</table>

The statistical difference between sexes is not significant at 5% level (df=4, $z^2 = 2.49$, $p > 0.1$).
GENERAL PUBLIC'S INTENTION TO CHANGE THEIR LIFE-Styles TO SAVE THE EARTH

Tests of Difference (At the 5% Level)

* Between "Street Interview" and "Gallery Questionnaire": significant (df=4; \( \chi^2 = 11.85; 0.05 > p > 0.001 \)).

* Between "Street Interview" and "School Questionnaire": significant (df=4; \( \chi^2 = 12.14; 0.05 > p > 0.001 \)).

* Between "Gallery Questionnaire" and "School Questionnaire": not significant (df=4; \( \chi^2 = 7.91; 0.1 > p > 0.05 \)).
THE DATA AGGREGATED

GALLERY QUESTIONNAIRES IN THE ECOLOGY EXHIBITION, THE NHM/SCHOOL QUESTIONNAIRES IN THE UK/STREET INTERVIEWS IN LONDON

<table>
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<th>4</th>
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<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>%</td>
<td>2</td>
<td>6</td>
<td>35</td>
<td>35</td>
<td>22</td>
<td>100</td>
</tr>
</tbody>
</table>

1: Not at all  
5: A great deal

MODE: 3  
MEAN: 3.7

---

(%)  

1: Not at all  
5: A great deal

SEMANTIC DIFFERENTIAL
5. Whose future responsibility is it to help "Save the Earth"?

Respondents were asked to choose one category only from "Government"; "employers"; "conservation groups"; and "individual persons". However plural answers were also accepted. The results concentrated on "Government" and "individual persons", that is, the rate of answer of the former was 39%, and the latter was 55%. There was no statistical difference at the 5% level between sexes, and between these results and previous studies, the "Gallery Questionnaire" and the "School Questionnaire". Also the aggregate of all these data were analysed and the "mode" was "individual persons". These results are shown graphically in figures 7.27 and 7.28 as follows.

<table>
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<th>3</th>
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</tr>
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<tbody>
<tr>
<td><strong>MALE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(No)</td>
<td>17</td>
<td>2</td>
<td>2</td>
<td>29</td>
<td>50</td>
</tr>
<tr>
<td>(%)</td>
<td>34</td>
<td>4</td>
<td>4</td>
<td>58</td>
<td>100</td>
</tr>
<tr>
<td><strong>FEMALE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(No)</td>
<td>24</td>
<td>1</td>
<td>1</td>
<td>30</td>
<td>56</td>
</tr>
<tr>
<td>(%)</td>
<td>43</td>
<td>2</td>
<td>2</td>
<td>53</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<td></td>
</tr>
<tr>
<td>(No)</td>
<td>41</td>
<td>3</td>
<td>3</td>
<td>59</td>
<td>106</td>
</tr>
<tr>
<td>(%)</td>
<td>39</td>
<td>3</td>
<td>3</td>
<td>55</td>
<td>100</td>
</tr>
</tbody>
</table>

1: GOVERNMENT  
2: EMPLOYERS  
3: CONSERVATION GROUPS  
4: INDIVIDUAL PERSONS

MODE: 4

Not significant difference between sexes at the 5% level (df=3; $\chi^2 = 1.54; p>0.1$).
GENERAL PUBLIC'S OPINIONS AS TO WHOSE FUTURE RESPONSIBILITY IT IS TO SAVE THE EARTH

GALLERY QUESTIONNAIRES IN THE ECOLOGY EXHIBITION, THE NHM/
SCHOOL QUESTIONNAIRES IN THE UK/STREET INTERVIEWS IN LONDON

<table>
<thead>
<tr>
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<th>4</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>32</td>
<td>4</td>
<td>4</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

1: GOVERNMENT
2: EMPLOYERS
3: CONSERVATION GROUPS
4: INDIVIDUAL PERSONS

MODE: 4

The statistical differences between the "Street Interview" and other studies are not significant at the 5% level that is the "Gallery Questionnaire" (df=3, $\chi^2 = 3.13, p>0.1$); pupils (df=3, $\chi^2 = 5.26, p>0.1$), and teachers (df=3; $\chi^2 = 7.7$, 0.1$p>0.05$).
6. If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it?

Respondents were asked to choose one from a 5-point scale: from "1" (definitely no) to "5" (definitely yes). Although it was a leading question using the words "very attractive", in order to get a high positive score, the results spread almost evenly from "3" to "5". The "mode" was "5", and the "mean" was "3.9". The significantly statistical difference at the 5% level was not shown between sexes (df=4, $\chi^2 = 5.57$, $p>0.1$), and between these results and the "Gallery Questionnaire" (df=4, $\chi^2 = 4.98$, $p>0.1$), and pupils by the "School Questionnaire" (df=4, $\chi^2 = 3.32$, $p>0.1$). However the significance at the 5% level was shown between the "Street Interview" and teachers by the "School Questionnaire" (df=4, $\chi^2 = 13.14$, 0.05$p>0.01$). In addition, the total of these results has been analysed and the "mode" was "5", and the "mean" was "4" which were very close to the results of the "Street Interview". All these results are shown graphically in figures 7.29, 7.30, and 7.31 as follows.


<table>
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</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>47</td>
</tr>
<tr>
<td>(No)</td>
<td>2</td>
<td>3</td>
<td>13</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>(%)</td>
<td>4</td>
<td>6</td>
<td>28</td>
<td>32</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>FEMALE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>(No)</td>
<td>0</td>
<td>1</td>
<td>18</td>
<td>13</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>(%)</td>
<td>0</td>
<td>2</td>
<td>33</td>
<td>23</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>102</td>
</tr>
<tr>
<td>(No)</td>
<td>2</td>
<td>4</td>
<td>31</td>
<td>28</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>(%)</td>
<td>2</td>
<td>4</td>
<td>30</td>
<td>28</td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>

1: Definitely no
2: Definitely yes

**MODE**: 5 / **MEAN**: 3.9

The statistical difference between sexes is not significant at the 5% level (df=4; $\chi^2 = 5.57, p>0.1$)
DIFFERENCE BETWEEN PEDESTRIANS IN LONDON AND TEACHERS IN THE UK

IN TERMS OF INTEREST IN VISITING A VERY ATTRACTIVE ECOLOGY
EXHIBITIONS, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT"
J. H. IGUCHI 1994

The statistical difference between pedestrians and teachers is significant at the 5% level (df=4, $\chi^2 = 13.14$, $0.05 > p > 0.01$).
GENERAL PUBLIC'S INTEREST IN VISITING A VERY ATTRACTIVE ECOLOGY EXHIBITION, DESCRIBING "HUMAN IMPACTS ON THE ENVIRONMENT"

J. H. IGUCHI 1994

GALLERY QUESTIONNAIRES IN THE ECOLOGY EXHIBITION, THE NHM/SCHOOL QUESTIONNAIRES IN THE UK/STREET INTERVIEWS IN LONDON

<table>
<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>4</td>
<td>18</td>
<td>91</td>
<td>104</td>
<td>134</td>
</tr>
<tr>
<td>%</td>
<td>1</td>
<td>5</td>
<td>26</td>
<td>30</td>
<td>38</td>
</tr>
</tbody>
</table>

1: Definitely no  
2: Definitely yes

MODE: 5  
MEAN: 4

---

definitely no  
SEMANTIC DIFFERENTIAL  
definitely yes
c) DISCUSSION

Through the analyses of the "Street Interview" and tests of difference between these studies and previous studies, some significant points arose. These are now discussed.

1. MEANING OF ECOLOGY

This subject is a multi-disciplinary science combining biology, earth science and even parts of sociology. Hence the general public might find it difficult to briefly explain the meaning of ecology. That is why 4 similar answers were presented to respondents to allow the choice of one. The percentage of correct answers was 49%. However, according to the results of the "Ecology Quiz" which asked the same question to visitors who were about to see the Ecology Exhibition, the percentage of the correct answer was 72%. Hence it might be seen that these visitors have more knowledge about this discipline than the general public.

2. FAMILIAR TECHNICAL TERMS OF ENVIRONMENTAL ISSUES

The top 5 terms or issues were "ozone layer (depletion)" (17%); "gases/passive smoking" (12%); "deforestation" (11%); "loss of habitats/endangered species"; (11%); and "greenhouse effect" (8%). In fact some of these problems do not affect us directly in terms of our health, but in a roundabout way, they do affect us in a deadly way such as skin cancer caused by ozone layer depletion. The knowledge of "ozone layer (depletion)" was rated the highest in importance in this survey probably because it was mentioned a good deal in the media and in schools. Hence any kinds of environmental education such as newspapers; magazines; exhibitions; events
concerned the issues; adult education; and school education are vital tools in conserving the environment.

3. WHETHER THEY HAD TAKEN PART IN ANY EVENTS ON ENVIRONMENTAL ISSUES

The results showed that one in four people (25%) had some direct experiences of taking in part in such events, which was very similar to the results of the "Gallery Interview" in the Ecology Exhibition. Some of them had taken part in some big events but most respondents reported their experiences with small events and the top of those was "recycling". Perhaps taking part in some big events might be difficult or impossible for the general public for a variety of reasons. However taking part in these events might not be the most effective actions for saving the environment, rather small everyday actions such as refraining from tipping rubbish on the roads might be more effective. "Recycling" is arguably a relatively easy way to conserve the environment, and in this author's view point, it should be encouraged.

4. THE EXTENT TO WHICH THEY INTENDED TO CHANGE THEIR LIFE-styles TO HELP "SAVE THE EARTH".

The results varied from "3" to "5" nearly equally on the scale of from "1" (not at all) to "5" (a great deal). The statistically significant difference between these results and others was shown at the 5% level that is the "Gallery Questionnaire" (0.05>p>0.01) and the "School Questionnaire" (0.05>p>0.01), because as to the answer "5" (definitely yes), the percentage of the "Street Interview" was higher than other studies. One of the reasons for these results could be that respondents in the Gallery and schools spent a great deal of time considering their responses and ended up avoiding the extremes.
The mean of the total of these data was "3.7" and the distribution was positive skewed. From these results it might be argued that it is not so easy to change people's life-styles even to a small extent. However they do seem to make efforts to change their life-styles to help "save the Earth". Especially the evidence of 57% of the answers that is "4" and "5" (a great deal) suggests hopeful prospects in terms of saving our planet.

5. Whose future responsibility it is to "save the Earth"

Respondents were asked to choose only one category from "Government"; "employers"; "conservation groups"; and "individual persons" and most respondents chose "Government" (39%) and "individual persons" (55%). The main purpose of this question was to ask respondents how they felt about their own responsibility to "Save the Earth". Some people answered "Government" might think that the only way to save our planet is political power, and they might not help the environment clean, and might tip rubbish everywhere for example. Other categories: "employers" and "conservation groups", were not expected to be chosen as much because the former is considered as being close to "Government", and the conservation groups are seen close to the "individual persons". The total of data by the "Gallery Questionnaire"; the "School Questionnaire"; and the "Street Interview" showed that 60% of respondents thought that the most responsible category was "individual persons", and 32% thought that it was "Government". Through these studies it might be seen that the majority of people are aware of their own responsibility to save the earth, but at the same time they realise that political power needs to be exercised to help them be effective.

6. If there was a very attractive ecology exhibition, describing human impacts on the environment, whether they would go to see it
Respondents were asked to choose only one from a 5-point scale: from "1" (definitely no) to "5" (definitely yes). The results showed nearly equally from "3" to "5", although this question was hypothetical and leading question using "if" and "very attractive" to get a high positive score. Significantly statistical difference between these results and those of teachers by the "School Questionnaire" was shown at the 5% level, because 68% of the teachers chose "5" (definitely yes), but pedestrians who chose "5" were 36%. It might be said that teachers are more keen to see such types of exhibitions as a part of their professional discipline. In addition, the distributions of the total of the results of 3 studies: the "Gallery Questionnaire"; the "School Questionnaire"; and the "Street Interview" showed similar distributions to those of the "Street Interview".

According to existing studies in terms of the image of museums by the general public was "musty and gloomy" (see p14), perhaps that is why the percentage of answer "3" was relatively high (26%), despite of asking about "a very attractive exhibition". This has been reinforced by several different elements of this PhD research. Consequently it can be concluded that the majority of people want more attractive exhibitions than traditional exhibitions. One of the examples of these types of exhibits in the Ecology Exhibition was the "Water Cycle", a kind of film, using a quadroscope surrounded by some mirrors to make a huge sphere shape, which was the most memorable and enjoyable exhibition obtained from the "School Questionnaire" (see Fig 7.11, p386).

From these results it might be seen that a memorable and attractive ecology exhibition would be successful in achieving the aim of such exhibitions, and to plan these types of exhibitions is a vital task for planners as a contribution to environmental education, since they would alert the general public to such issues.
This chapter on "sociological analysis" studied not only the Ecology Exhibition but also the degree of environmental awareness of the general public through some fieldwork which became a part of the case study. Firstly the motives for visiting the Ecology Exhibition were investigated. Secondly the educational backgrounds of visitors to the Exhibition were looked into. Thirdly recollection studies were conducted using the method of mailed questionnaires to the schools, and at the same time the degree of their environmental awareness was gauged. Lastly street interviews were conducted and analysed in terms of that awareness. All these results should help the planning of environmental education through museums.
CHAPTER 8

SUMMARY AND FUTURE

POLICY IMPLICATIONS

(KERROD R. & STIDWORTHY J., 1992, WILDLIFE - ATLAS)
This chapter will summarise the case study on the Ecology Exhibition using some diagrammatical explanations, and suggest the future role of ecology exhibitions.

[1] EXHIBITION PLAN AND EVALUATION (TCRD SYSTEM)

In order to explore the research questions already stated (see pp195-198) concerning the Ecology Exhibition and to examine people’s attitudes towards saving the environment, a variety of studies have been conducted, and all these studies are directly related to environmental education through museums, in particular, ecology exhibitions. Hence, based on all this research, an ideal method for the planning of exhibitions and their evaluation is proposed and can be summarised briefly as a flow of a system "TCRD" (a term coined by this researcher) shown in figure 8.1. This idea has been drawn from a radio transmitter-receiver system, and a remote control system. The reason for using these systems for explaining an approach to planning exhibitions and evaluation is that there is an analogy between the two, which will be discussed in detail below. The term "TCRD" comes from 4 capital letters of "Transmitter"; "Carrier"; "Receiver"; and "Drive". Each of the 4 stages are explained as follows.

(A) TRANSMITTER (MESSAGE/SETTING UP THE EXHIBITION)

First of all, "power source" (or funding for setting up an exhibition) is vital to drive the transmitter, and this part should be argued from different angles in terms of budget which might come from the Government, local authorities, sponsors and entrance fee to set up and allow the exhibition to thrive.

Secondly "signal" (message) suggests the subject matter input by specialists in part through their publications. In the case of ecology exhibitions, they are
not only ecologists but also conservationists, geographers and curators in order to reinforce the content of the exhibition. In addition the ideas of sociologists and anthropologists might help to develop the section on the "human impacts on the environment". To use ideas from different disciplines does not necessarily mean the messages of the exhibition become too diverse, but it does mean that some different ideas are incorporated from a range of disciplines with knowledge and interest in ecology.

Thirdly the message is sent to "modulator" which modulates the message in order to equip on the "carrier" that is the exhibition and other educational materials such as take-away texts; quiz sheets, considering affective and cognitive effects made by mainly curators, educators and designers. Before and during planning the exhibition, front-end evaluation and formative evaluation should be needed in terms of the subject matter about the message; the exhibition design using the theory of environmental psychology; and educational effects using the theory of cognitive psychology. These results are informed through a feedback route to the staff and other specialists who are in a position of responsibility to complete the exhibition. The example of "positive feedback" is to increase information, artefacts or devices, and of "negative feedback" is to avoid earlier pitfalls such as decreasing information or removing unnecessary parts of the exhibition. At this stage, the planners must bear in mind that the message of the exhibition should be as unbiased as possible avoiding for instance right wing and left wing ideologies.

(B) CARRIER (EXHIBITION)

Exhibitions consist of media and messages like radio waves consisting of carriers and signals. The most important task in this stage is to send the message to a receiver (visitor) efficiently and with minimum loss. To achieve
this, a summative evaluation can be needed which examines the subject matter; the exhibition design considering environmental psychology; and educational effects considering cognitive psychology. Then the results need to be informed to the staff and other specialists concerned for any necessary changes.

(C) RECEIVER (VISITOR)

In this stage, "Receiver" that is "visitor" can get the message with affective and cognitive effects through "Detector" that is 5 senses organs: vision (eyes); hearing (ears); taste (tongue); touch (skin); and smell (nose): Then the information is stored in "memory". However the memory system is not like an electric memory machine which can store the information permanently, since humans of course can forget it. The stages of memory in terms of the duration are mainly two types, that is "short term memory" (up to 30 seconds) and "long term memory" (30 seconds plus to permanent) (Wade C. & Tavris C. 1993:243). Then the visitor can retrieve the message from his/her memory organs that is the stage of "output" for the signal. In this stage also summative evaluation can be needed to adjust the content of the exhibition to the target audience, and also to rethink how to create educationally effective exhibits which visitors can retain in their memory for a long time.

(D) DRIVE (INFLUENCE OF THE MESSAGE ON A VISITOR'S LIFE)

In the case of remote control systems, signals as "output" can drive a target instrument and similarly, in the case of visitors, the information obtained by visitors from the exhibition may influence their lives. For instance it might reinforce their work at school or might change their life-styles somewhat towards saving the earth in the case of ecology exhibitions. This stage is named "Drive" and is the ultimate aim for any exhibition. Hence a "follow up
survey" can be needed as summative evaluation and the positive and negative results are informed through a feedback route to the staff or other specialists concerned.

In this case study on the Ecology Exhibition, a summative evaluation in terms of the stages of "Carrier" (the exhibition completed), "Output" and "Drive" were conducted using the method of the "Observation"; "Questionnaire"; "Ecology Quiz" in the gallery, "Interview" in the gallery and streets, and "Mailed Questionnaire" to schools. All these stages are shown diagrammatically in figure 8.1 as follows.
EXHIBITION PLAN & EVALUATION

TCRD SYSTEM

T: TRANSMITTER
C: CARRIER
R: RECEIVER
D: DRIVE

T TRANSMITTER

POWER SOURCE FUNDING

INPUT SIGNAL MESSAGE

MODULATOR SETTING UP AN EXHIBITION WITH AFFECTIVE & COGNITIVE EFFECTS

C CARRIER EXHIBITION

DETECTOR FOR SIGNAL (MESSAGE) WITH AFFECTIVE & COGNITIVE EFFECTS

MEMORY SHORT TERM LONG TERM

OUTPUT SIGNAL MESSAGE

INFLUENCE OF THE INFORMATION ON A VISITOR'S LIFE

FOLLOW UP SURVEY

SOCIOLOGIST ANTHROPOLOGIST

ECOLOGIST CONSERVATIONIST GEOGRAPHER CURATOR

CURATOR EDUCATOR DESIGNER

AN ECOLOGY EXHIBITION

FRONT-END EVALUATION
FORMATIVE EVALUATION
SUBJECT MATTER/ENVIRONMENTAL PSYCHOLOGY/COGNITIVE PSYCHOLOGY

POSITIVE/NEGATIVE FEEDBACK

SUMMATIVE EVALUATION
SUBJECT MATTER/ENVIRONMENTAL PSYCHOLOGY/COGNITIVE PSYCHOLOGY

Fig 8.1

J. H. IGUCHI 1995
In this section, an approach to analysing ecology exhibitions will be suggested which is in part a summary of this research.

(A) ANALYSIS OF ECOLOGY EXHIBITIONS FROM DIFFERENT PERSPECTIVES

The process of setting up ecology exhibitions is described in figure 8.2 below and this can be the basis for generalisations about any exhibition. It can be summarised in 5 stages that is "Funding" (for setting up an exhibition); "Message" (subject matter); "Exhibition and other educational materials"; "Issues raised" (from some evaluation that is front-end/formative/summative evaluation); and "Improvement".

Analysis of ecology exhibitions should use a variety of technical methods from a range of disciplines. "Museology" is an umbrella term including museums in theory and in practice, and analysts can choose a specific field from these to analyse the exhibition depending on purpose. In the case of ecology exhibitions, the following disciplines/fields of activity offer important and distinctive perspectives. They are: "Ecology" (subject matter); "Museum Education" (methods of museum education services); "Environmental education" (methods of environmental education for both at school and in the field including museums); "Visitor studies" (especially concentrating on visitors’ behaviour and attitudes in the so-called museums); "Environmental Psychology" (for architectural design of the exhibition and organisation of the exhibition); "Cognitive Psychology" (for educational effects); "Information Technology" (for affective and cognitive effects); and "Sociology" (to grasp the nature and backgrounds of visitors, and follow-up survey about visitors).
All these aspects are connected with this research and some information and considerable data have been gained and analysed which are shown in chapters 1 to 7. All these processes are shown diagrammatically in figure 8.2 below.

ANALYSIS OF ECOLOGY EXHIBITIONS

Fig 8.2

[Diagram showing the relationship between ecology, museum education, environmental education, visitor studies, ecology exhibition, funding, message, exhibition and other educational materials, issues raised, improvement, environmental psychology, cognitive psychology, information technology, and sociology.]
(B) SEQUENCE FOR THE ANALYSIS OF EXHIBITIONS (PPM SYSTEM)

One of the sequences for the analysis of ecology exhibitions, which this case study on the Ecology Exhibition has been conducted, can be summarised as "PPS system" coined by this author. The term "PPS" comes from the 3 capital letters that is "Physical analysis"; "Psychological analysis"; and "Sociological analysis". Each form of analysis was defined in chapter 4, (see p196). The task of each stage overlapped each other in terms of the "Physical", "Psychological" and "Sociological". For example, in the stages of the "Physical analysis" and "Sociological analysis", psychological studies are included, but mainly each stage possesses its own characteristics. "Psychological analysis" examines visitors' attitudes and behaviour towards the exhibition. The results of this research have been described and discussed extensively in this thesis from the PPS's point of view. The sequence is shown in figure 8.3 below.

SEQUENCE FOR THE ANALYSIS OF EXHIBITIONS

(PPM SYSTEM)

Fig 8.3

-439-
This section suggests the setting up of ideal ecology exhibitions with affective and cognitive aspects and the future role of ecology exhibitions, such as an "Ecolia Project" will be recommended.

(A) REASON FOR SETTING UP ATTRACTIVE ECOLOGY EXHIBITIONS

Firstly, from the results of all studies in this thesis, effective ecology exhibitions are essential to make the general public aware of environmental issues. The exhibitions must not be old-fashioned exhibits in glass cases, but they need to fully alert the 5 senses to be most effective. In other words, such exhibitions should be set up bearing in mind cognitive as well as affective influences. Consequently, exhibitions should be more attractive than old-fashioned exhibitions.

The idea comes from the results of this research that is: the most enjoyed sections in the Ecology Exhibition by visitors were mainly a huge quadroscope called "Water cycle"; life size "Rainforest"; and enlarged leaf's organ called "Leaf factory", and 44% of visitors chose these three sections out of the nineteen sections presented for the answers. Similarly according to the results of mailed questionnaires to schools as a recollection study, 51% of respondents, who visited the Ecology Exhibition around one year ago, could remember these same 3 sections. Also 68% (238 respondents out of 351) of the general public, who were general visitors, teachers and pupils, and pedestrians in London, were interested in visiting attractive ecology exhibitions describing "Human impacts
on the environment" choosing "4" and "5" on the scale of from "1" (definitely no) to "5" (definitely Yes).

All these data support the setting of attractive ecology exhibitions in order to make the general public more aware of environmental issues, from younger children to elderly people with a variety of educational backgrounds. However the exhibition planners must bear in mind that these exhibitions must not just be like amusement parks but must educate effectively. Also more detailed information should be available from other supplementary offerings such as lectures and field study tours.

Secondly, according to the results of the sociological analysis, 57% (176 respondents out of 313) of the general public intended to change their life-styles to save the earth showing "4" and "5" on the scale of from "1" (not at all) to "5" (a great deal). And also, in answer to the question as to whose future responsibility it is to save the earth, 60% (227 respondents out of 376) of the general public said "individual persons" and 32% of them said "Government". From these results, the majority of the general public became aware of environmental issues as their own responsibility and intended to change their life-styles to save the earth. Hence it might be timely that effective ecology exhibitions would enlighten the general public. As a result of rising visitors' awareness of environmental issues through such exhibitions, the pressure from the public to "save the earth" will arguably lead governments to develop new policies for solving these issues.

(B) WORLD ECOLIA NETWORK SYSTEM (WENS)

Firstly, new ideal ecology exhibitions or museums must be made popular with the general public. The term "museum" has a somewhat old image, hence instead of
it, the term "ecolium" that means "ecology museum" has been created. The aim of the ecolia (ecolium's plural) can be to "Save the Earth" and in particular to conserve animals, plants and minerals. The content of such exhibitions for achieving the aim are mainly "ecology" describing vulnerable biosphere and "earth science" describing atmosphere; hydrosphere; and lithosphere which are vital ingredients for life. Also it is vital to introduce "human impacts on the environment" through practical issues. According to the results of the "Gallery Interview" in the Ecology Exhibition, about whether the Exhibition needed to be improve, a section of "human impacts" gained top ranking.

In addition, an ecolium is not necessarily within a building. As the definition of museums discusses (see pp5-12), the nature of the ecolia includes mobile/itinerant exhibitions (see pp22,23); field study centres; and natural parks. Furthermore, an ecolium does not exist for just showing exhibitions but behind the scenes, as many existing museums have done, research into the discipline must be conducted, and the results must be exchanged with another ecolium to make progress as an academic institution. Hence ecolia are a form of "earth conservation centres".

Secondly, a network system of ecolia must extend to other kinds of museums. For example, science museums have a responsibility to educate the peaceful use of hi-technology for the earth, like the Science Museum in London which has some conservation projects (see p78,79); history museums can appeal for conservation of heritage sites like Ironbridge Museum in the UK (see p75); and art museums can also educate for the conservation of nature and culture such as those in the National Gallery in London, using some artefacts (see p79).

Thirdly, this huge network must extend through the world named "World Ecolia Network System" (WENS), and the information must be exchanged between them and
must be shown to the public through ecolia, other museums and exhibitions, or mass media like broadcasts, newspapers and magazines. Also holding regular international conferences is essential to improve such ecolia and their related research projects and to safeguard the vulnerable earth which is the indispensable home of us all now and in the future. In effect, arguably the biggest ecolium is the earth itself. The project is shown diagrammatically in figure 8.4.
FUTURE ROLE OF ECOLOGY EXHIBITIONS

ECOLIA PROJECT

EARTH CONSERVATION CENTRE-ECOLIUM

ECOLIUM WAS
COINED BY
J. H. IGUCHI
WHICH MEANS
ECOLOGY MUSEUM
(OR EXHIBITION)

THE BIGGEST ECOLIUM
CAN BE
THE EARTH ITSELF

J. H. IGUCHI 1995
To achieve the main aim of this research that is "how to educate about environmental issues through museums, especially through ecology exhibitions, in order to save the earth", a literature survey and a case study of the Ecology Exhibition in the NHM, London and a survey of the general public in terms of this Exhibition as well as their awareness of environmental issues were conducted. Firstly to grasp the background theory on this discipline as historical analysis, museum education in general; environmental education; and new field "visitor studies" for museums were examined. Secondly, based on these studies, the research methodology and secondary data relating to the NHM and in particular the Ecology Exhibition were discussed. Thirdly, as the main research project, a case study relating to the Ecology Exhibition was conducted and the results were discussed based on the methodology which were: "Physical analysis"; "Psychological analysis"; and "Sociological analysis". Finally future policy implications were suggested.

Throughout this thesis, many results and their discussion were mentioned for each study. However, all in all, the following three results shows a positive trend towards saving the earth and encourages setting up "ecolia" and the "World Ecolia Network System (WENS, see p444). They are:

1. 60% (227) of respondents felt that to save the earth was their own personal responsibility.
2. 57% (176) of respondents intended to change their-life styles to save the earth.
3. 68% (238) of respondents were interested in visiting very attractive ecology exhibitions describing "Human impacts on the environment".

These days we can still see blue sky and many forests. But if we do not care for the environment as an urgent priority, the end of the earth will soon come about.
APPENDICES

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DEFINITION OF MUSEUM BY ICOM

ICOM STATUTES
Adopted by the 16th General Assembly of ICOM (The Hague, 5 September 1989)

Article 1 – Name and Legal Status

1. The International Council of Museums (ICOM) is the international non-governmental organization of museums and professional museum workers established to advance the interests of museology and other disciplines concerned with museum management and operations.

2. ICOM consists of its members acting cooperatively in National and International Committees and Affiliated and Regional Organizations, assisted by its Secretariat.

3. The Registered Office and Secretariat of ICOM shall be at such place as the General Assembly, with the approval of Unesco, may decide. ICOM shall take such steps as are necessary and appropriate to obtain such privileges and benefits as may be available under the law of the land where the ICOM registered office and Secretariat are located.

Article 2 – Definitions

1. A museum is a non-profit making, permanent institution in the service of society and of its development, and open to the public which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment.

(a) The above definition of a museum shall be applied without any limitation arising from the nature of the governing body, the territorial character, the functional structure or the orientation of the collections of the institution concerned.

(b) In addition to institutions designated as "museums" the following qualify as museums for the purposes of this definition:

(i) natural, archaeological and ethnographic monuments and sites and historical monuments and sites of a museum nature that acquire, conserve and communicate material evidence of people and their environment;

(ii) institutions holding collections of and displaying live specimens of plants and animals, such as botanical and zoological gardens, aquaria and vivaria;

(iii) science centres and planetaria;

(iv) conservation institutes and exhibition galleries permanently maintained by libraries and archive centres;

(v) nature reserves;

(vi) such other institutions as the Executive Council, after seeking the advice of the Advisory Committee, considers as having some or all of the characteristics of a museum, or as supporting museums and professional museum workers through museological research, education or training.

2. Professional museum workers include all the personnel of museums or institutions qualifying as museums in accordance with the definition in Article 2, para 1, having received specialized training, or possessing an equivalent practical experience, in any field relevant to the management and operations of a museum, and privately or self-employed persons practising in one of the museological professions and who respect the ICOM’s Code of Professional Ethics, which is annexed to these Statutes.

3. A member of ICOM in good standing is a person or institution that has paid the annual subscription (and any arrears owing) by 1 April in the year to which the subscription relates.

4. A State is a self-governing country that is a member of the United Nations or any of its Specialized Agencies or of the International Atomic Energy Agency or a party to the Statutes of the International Court of Justice.
**APPENDIX 2: MAIN TERMS IN THE MAIN PARAGRAPHS IN THE MUSEUM DEFINITIONS**

<table>
<thead>
<tr>
<th>TERMS</th>
<th>ICOM</th>
<th>USA</th>
<th>JAPAN</th>
<th>UK</th>
<th>AUTHOR</th>
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<tr>
<td>1 non-profit, permanent</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>2 institute, establishment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>3 describing examples of institute</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>4 collect, acquire</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5 conserve, preserve</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6 research, interpret, document</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7 material evidence of people and their environment (inc. some subjects)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8 exhibit</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
</tr>
<tr>
<td>9 for society, public</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>11 interest, enjoyment, recreation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>12 communication</td>
<td>✓</td>
<td></td>
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</tr>
</tbody>
</table>
Dear Jack,

It turns out that the Education Unit does not at present have an official concise statement of its aims and objectives. However, the following paragraph covers our present activities. I hope you will find this useful.

The Education Unit provides a service for over 250,000 educational visitors each year in more than 5,000 groups. We support the teachers of these groups by providing resources, teachers' courses and INSET sessions. The Education Unit also runs the three interactive areas in the Museum: Launch Pad, Flight lab and Food for Thought. As part of this work we run a series of demonstrations for all our visitors.

You will also see that I have managed to find some more resources on an environmental theme, in addition to the ones I gave you on Wednesday. Please feel free to contact either myself or Jane Insley if we can be of any further help to you.

Yours sincerely,

Xerxes Mazda

The mission of the National Museum of Science & Industry is:

to be the nation's leading centre for the public understanding of science by caring for, presenting and interpreting the national collections of science, technology and medicine.

Science Museum London SW7 2DD Telephone 071-938 8222
APPENDIX 4:

SOCIAL CLASS DIFFERENCES IN BRITAIN FOR MARKET RESEARCH

A: UPPER MIDDLE CLASS (3%)
Successful business persons (e.g. self-employed/manager/executive of large enterprise); higher professionals (e.g. bishop, surgeon/specialist, barrister, accountant); senior civil servants (above Principal) and local government officers (e.g. chief, treasurer, town clerk).

B: MIDDLE CLASS (14%)
Senior, but not the very top, people in same areas as A.

C1: LOWER MIDDLE CLASS (22%)
Small tradespeople, non-manual, routine administrative, supervisory and clerical (sometimes referred to as "white-collar" workers).

C2: SKILLED WORKING CLASS (28%)

D: SEMI-SKILLED AND UNSKILLED WORKING CLASS (18%)

E: THOSE AT THE LOWEST LEVELS OF SUBSISTENCE (15%)
Including OAPs, those on social security because of sickness or unemployment, and casual workers.

Resources on ecology suitable for pupils at Key Stages 1 and 2

Books

**Clean Air, Dirty Air**  
Lynne Patchett  
pub. AC Black  
IBSN: 0-7136-3325-5

**Trees for Tomorrow**  
Lynne Patchett  
pub. AC Black  
IBSN: 0-7136-3327-1

Two books of particular relevance to ATs 1 and 5. Clear photographs and diagrams, plus directions for simple experiments on acid rain, soil erosion and testing pollution levels.

**Life in the Deserts**  
**Life in the Oceans**  
**Life in the Rainforests**  
**Life in the Polar Lands**  
Various authors  
pub. Two-can

A series of useful reference books which cover the native peoples, animals and plants of the different environments and look at conservation issues. They include legends and stories from the areas and helpful glossaries.

**Ecology - a practical introduction with projects and activities**  
Richard Spurgeon  
pub. Usborne  
IBSN: 0-7460-0288-2

A comprehensive guide to ecology, suitable as a reference book for KS 2. Suggestions for plant and soil experiments, keeping an ant colony, building a pond etc. Cartoon style illustrations. No photographs.
Conserving Our Rainforests
Martin Banks pub. Wayland
IBSN: 1-85210-695-6

Part of a series which also includes books on acid rain, waste and recycling, atmosphere, wildlife conservation and desertification. Beautiful photographs of rainforest animals, plants and people. Text is often quite difficult and dense. Suitable for reference or for reading with children.

Teaching packs and guides

A Rainforest Child
Sue Lyle and Maggie Roberts pub. Greenlight Publications

A cross-curricular activity pack for ages 8-13, closely linked to the National Curriculum. Activities cover English, science, technology and geography, and include background information, photocopy masters, cards and a cassette of the musical Song of the Rainforest by Sting.
Order from: Greenlight Publications, Ty Bryn, Coomb Gardens, Llangynog, Carmarthen, Dyfed. SA33 5AY

Pond Watch - a key to freshwater invertebrates
Consultant- Sheila Turner pub. Learning development aids
IBSN: 1-85503-091-8

This pack is designed for children with special needs, but can quite easily be used as an introduction to pond life for KS 1 and 2. It is relevant to ATs 1-3. It is well designed, and the information and methods of identification are presented simply and clearly, with charts for photocopying and line diagrams.

Ecology in the National Curriculum
P. Rupert Booth pub. Learning through Landscapes Trust
Order from: Learning through landscapes trust, 3rd floor, Technology House, Victoria Road, Winchester, Hants S023 7DU
£3.00 + 50p p&p

This booklet for teachers looks at the study of ecology in school grounds. It provides helpful and inspiring examples of work undertaken in schools at each key stage, with particular emphasis upon ATs 1 and 2.
Computer programmes

Pondlife
Penny Anderson
Order from: Mercury Music Co Ltd, PO Box 194, Sevenoaks, Kent TN15 8TZ

A computer software pack designed for 9-13 year olds, of particular relevance to ATs 1, 2, 3 and 5. The pack provides ideas for cross-curricular work relating to pond study, and two computer programmes - one on identification of common pond animals, the other on pond modelling. The first programme has some disappointingly unclear diagrams, but the second is more interesting, allowing the user to create and stock a pond and then see how the balance of life in it is affected by various climatic and human changes.

5/3/91
Resources on ecology for pupils at Keystage 3 & 4.

Global Ecology
Colin Tudge
The Natural History Museum (1991)
ISBN 0565 011731

This book enlarges and complements the Ecology exhibition at the Museum. The clear text, and many photographs provide comprehensive background information to the study of Ecology for teachers. A useful addition to the school library.

Conserving the Jungles
L Williams
Evans Brothers Ltd (1989)
ISBN 0 237 51103 7

An attractive and comprehensive book. The information is well presented and includes plenty of clear drawings and diagrams. Keywords in bold type, are listed and explained. This book is recommended for use at both K.S. 3 & 4.

Science Now
The Biosphere
Steven T W Wright
Stanley Thornes Ltd (1989)
ISBN 0 7487 0202 4

This text book is intended for use as a GCSE module. The presentation is lively and attractive and it provides suggestions for lots of investigations. Parts of this book could be useful for work with younger pupils.

Atlas of Environmental Issues
Dr N Middleton
Oxford University Press (1988)
ISBN 0 19 831674 7

This book is recommended for GCSE students but would also be very useful for younger pupils. The information is set out very well with each of the 28 environmental issues occupying a double-page spread. There are lots of good diagrams, maps and drawings as well as clear text. A must for the school library.
Science for Survival
Plants and Rainforests in the Classroom

Adam Cade
Richmond Publishing Co. Ltd WWF UK (1988)
ISBN 0 85546 3511

This GCSE resource book for teachers forms part of the WWF - UK Environment Education project. It is full of ideas for practical activities aimed at allowing young people to assess the importance of plants.

Heinemann Core Science Bk 4
Environments

Series ed. S Kellington
Heinemann Educational Books (1984)
ISBN 0 435 575201

A useful pupil book which is colourful and lively with simple, clear language. The approach would be enjoyed by less academic pupils.

Opening Doors for Science
Some aspects of Environmental education and Science in the National Curriculum for 5 to 16

Adam Cade (Ed.)
Association for Science Education and the Nature Conservancy Council (1990)
ISBN 0 86 357-131 X

An invaluable book for all teachers involved in environmental education. Not only does it examine fitting environmental education into the National Curriculum but also learning and teaching approaches. Useful curriculum case studies at all Key Stages are included, together with ideas for related INSET.

PACK

Forest Matters
Global concerns - Environmental Perspectives

Sue Lyle, Alyson Jenkins and Stewart Roberts
Greenlight Publications
ISBN 0 951 24554 6

This pack is designed for use with the National Curriculum. It is relevant to Key Stage 4 in Geography, Science and English. The 7 case-study books include 42 activities with very comprehensive instructions and 80 ready-to-use copyright free photocopy masters. Useful for the 14 - 18 age range.
ORGANISATIONS CONCERNED WITH ECOLOGY

The following is a list of some of the many organizations and charities involved with environmental issues. We have selected those which offer resources or services particularly for teachers. Many worthwhile organizations have been omitted—if you have good experience of any particular one, please do let us know.

   3rd floor
   Technology House
   Victoria Road
   Winchester
   Hants SO23 7DU
   Tel: (0962) 846 258

The Learning Through Landscapes Trust advises on the design, use and management of the environment around schools. Schools can become members for a £10 fee, which entitles them to a termly newsletter, free activity sheets and a range of publications, which contain many good ideas about how to improve and develop your school grounds, and how to use them as a resource for teaching ecology. There is also a video available, Making the best of your school grounds.

2. Friends of the Earth
   26-28 Underwood Street
   London N1 7JQ
   Tel: (071) 490 1555

FoE operate a schools’ subscription service and produce a selection of educational publications. Their factsheets are for children aged 7-11 and 12-18 and cover various subjects including water pollution, recycling, and agriculture, with helpful background information and ideas for activities. These cost 50 pence each. Posters are also available. Subscription costs £25.00 per year and entitles members to a schools’ pack containing the educational literature, an annual mailing of educational material, a discount on publications and regular copies of their magazine Earth Matters.
3. London Wildlife Trust  
80 York Way  
London N1 9AG  
Tel: 071 278 6612

The Trust sets up and manages special 'natural parks' throughout London. School parties can book a site visit to some of these reserves with one of the Trust's study wardens. The main site, at Camley street near King's Cross, has been created from urban wasteland and has a special visitor area for information and exhibitions. Ring 071 883 2311 for details. The Trust produces a range of special educational publications, including the Wild seasons pack at £4.50, containing information sheets about different aspects of urban wildlife.

4. Watch  
The Green  
Witham Park  
Waterside South  
Lincoln LN5 7JR  
Tel: (0522) 544 400

Many teachers will already be familiar with the work of Watch, the section of the Royal Society for Nature Conservation for young people. For an annual subscription of £24.00 schools can join the Watch Education Service. This entitles them to a useful starter pack with topic sheets, surveys and background information on environmental themes. They also receive other benefits including regular copies of Watchword and Natural World magazines. Their Bat pack costs only £2.50. It is aimed at KS 2 and includes information and interdisciplinary activities for English, Art, History and Science.

5. The Wildfowl and Wetlands Trust  
Slimbridge  
Gloucestershire GL2 7BT  
Tel: (0453) 890 333

There are nine Wildfowl and Wetlands Trust centres throughout the British Isles. All have education programmes and many have special classrooms. Schools are asked to book and an admission charge is made. The Trust publishes a wide range of useful resources for teachers. The Wildfowl and Wetlands Pack, priced £3.95, is aimed at primary teachers. It contains informative, if rather lengthy, themed sheets with suggestions for activities based on environmental issues relevant to wetlands, stressing the importance of conservation, as does the Pondwatch pack. A range of Pondwatch factsheets gives practical information about creating, stocking, managing and observing ponds and pondlife.
6. The Royal Society for the Protection of Birds
The Lodge
Sandy
Beds SG19 2DL Tel: (0767) 680 551

The junior section of the RSPB is called the YOC, and provides materials, project guides, events, videos and a regular magazine for children on birds and related issues, in particular habitat conservation. School groups can join at a charge of £1.00 per child. RSPB schools' publications include a termly newsletter mailed through the LEAs, and a range of curriculum guides. One useful for ecology is the Predator-Prey Curriculum Guide featuring information, photocopiable diagrams and study material on adaptations, survival, pyramid of numbers and extinction. The guide is available from the Education Department at £2.50. The RSPB also runs a film hire service, with some short programmes specially designed for primary schools.

7. British Trust for Conservation Volunteers
36 Mary’s Street
Wallingford
Oxfordshire OX10 OEU Tel: (0491) 39766

The BTCV is involved in providing practical advice, training and information on environmental conservation. Schools can affiliate for a fee of £12 a year, which entitles them to a starter resource pack, Conservation in school grounds; Life Class, a termly resource sheet for teachers especially relevant to core and foundation subjects in the National Curriculum: the quarterly newsletter The Conserver and information about BTCV conservation working holidays. There is a range of publications for sale with the emphasis upon practical conservation projects, and a mail order catalogue for tools, clothing, trees and shrubs.

8. Worldwide Fund for Nature
Education Department
Panda House
Weyside Park
Godalming
Surrey GU7 1XR Tel: (0483) 426 444

The conservation work of the WWF is well known, and their education service and publications are now considerable. Teacher members receive 33% discount on all WWF materials, a quarterly WWF newsletter, a special teachers’ newsletter Lifelines every term, BBC Wildlife magazine monthly and a copy of Earthrights—education as if the planet really mattered. Teachers’ membership costs £25.00 a year. The range of educational publications is extensive, and includes wallcharts, posters and videos as well as books for teachers and pupils covering environmental and development issues, with clear links to the National Curriculum.

5/3/91
APPENDIX 7: PLANTLIFE

(AN ORGANISATION OF PLANTS CONSERVATION)

PLANTLIFE

1. "Save the plants and we’ll save planet and countryside" - David Bellamy, President

2. PLANTLIFE is Britain’s newest conservation charity dedicated to the protection of plants throughout the United Kingdom and abroad.

3. Twenty-two British plants are already extinct and a further 47 stand on the brink of oblivion. World-wide 60,000 plant species – one in four of the world’s total – will be lost before the end of the century if present trends continue.

4. Plants are the basis of all life on the planet and the Ecology Exhibition presents and summarises the complex web of life which depends on them. PLANTLIFE’s base at The Natural History Museum reflects the Museum’s increasing concern for conservation.

5. PLANTLIFE projects include:
   * Buying ancient meadows
   * Researching the impact of global warming on plants
   * Campaigning for peatlands
   * Recovering rare species

6. Professor David Bellamy is PLANTLIFE’s President.

7. For further information please contact Dr Jane Smart (Director); Rhonda Gregory (Office Manager) on 071-938-9111

c/o The Natural History Museum Cromwell Road London SW7 5BD
Telephone: 071-938-9111 Fax: 071-938-9112
Charity Number: 328576
APPENDIX 8:

TEXT OF PANELS FOR CHUNKS IN THE ECOLOGY EXHIBITION, THE NIM

COPYED BY J. H. IGUCHI FROM
PANELS INSTALLED, 1993

ECOLOGY:
Welcome to Ecology - where we explore the connections in the web of life - which mean that each individual animal, plant, and person is just one component in a complex system.

1. The rain forest
As you walk through the rain forest, think of all the different life forms - each linked to every other living thing and to the environment which surrounds them all. This is just one of the thousands of complex systems that make up the ecology of the earth.

2. Earth
Our planet is a giant system in constant movement:
- vast continents ride on a molten core
- huge currents move around the oceans
- the film of protective gases surrounding the earth moves constantly - responding to changes in ocean currents and land temperatures, and spreading complex weather patterns around the planet.

3. The atmosphere
The earth's atmosphere is like a store of gases. Some get absorbed into the oceans. Others interact with the minerals in the Earth's crust.
All living things exchange gases with their surroundings:
- most need to take in oxygen to function, and then release carbon dioxide
as a waste product
• some living things release gases that contain nitrogen and sulphur, and others take up these gases.

4. The hydrosphere
Water is essential to the complex chemical processes inside living cells. Without water, life could not exist.
The hydrosphere is the total reserve of water on Earth:
• most of it is salt water in the oceans
• much of the fresh water is trapped in glaciers and ice sheets
• the rest of the fresh water is moving in rivers and lakes, or in porous rock.

5. The lithosphere
The lithosphere is the solid rock of the Earth’s outer layers. It is a store of the chemical elements that are essential nutrients for life. These nutrients are released from the solid mineral world to other parts of the environment by:
• volcanic activity
• physical & chemical weathering.

6. Energy
The Earth orbits the huge hydrogen furnace that is the sun, and is bathed in its radiant energy.
The sun is the primary source of all the energy that warms our planet and that drives all the chemical processes of life.

7. The biosphere
A few kilometres beneath our feet the earth is white hot.
A few kilometres over our heads the air is thin and cold. In between is the biosphere - a narrow band lake of an apple where all the diverse forms of life flourish. Within the biosphere, every organism is linked to its environment, which includes all the other organisms around it. All of them need energy from the sun, and exchange nutrients with the earth, water, and air, around them.

8. Ecosystems

Each different environment has its own range of living organisms, linked together in a complex system. All the environments together form the web of ecosystems which make up the biosphere. Ecology is the study of these ecosystems. Take life in this African grassland ecosystem. How is it organized? Ecology tries to understand the whole picture by seeing how all the pieces fit together.

9. The water cycle

The sun's energy lifts moisture from the oceans to form clouds in the atmosphere. Winds, also driven by the sun's energy, bring this life-giving water to the land. As the water flows back to the oceans it performs another essential role for life - it erodes minerals and transports vital nutrients.

(This way)

10. Factors that limited life - in the oceans

Animals and plants are finely tuned to their particular environment. In the oceans, the variety of life in each ecosystem is shaped by different
feature of the water.
• temperature
• clarity
• depth
• light
• nutrients

11. Factors that limited life - on the land
Land ecosystems are shaped by many factors. The most important of these are seasonal changes in:
• daylight
• temperature
• rainfall

12. Energy and sunlight
Sunlight is essential for life. But direct exposure to the sun’s radiation would cause death. The earth’s atmosphere both shields the biosphere from the sun’s harmful rays, and allows some sunlight through for living things to use.

13. The leaf factory
Sunlight cannot be used directly in the chemical processes inside living things. Only green plants can take the sunlight that enters their cells and convert it into a usable chemical form.
There’s a giant leaf factory just behind this notice.

(This way to see how the energy is used by animals)

Energy moves through living communities:
Only green plants can directly convert the sun's energy to a usable form - carbohydrates. They are the vital link in the process of feeding - the way that all other living things get the energy and nutrients they need to grow.

14. What all living things need

energy [stars] to move, grow, and reproduce
raw materials [circles] to built their body tissues - oxygen, carbon, nitrogen and many more.

Green plants are the vital link between the sun and animals.

Plants get their energy from the sun and their raw materials from their surroundings. All other organisms get the energy and raw materials they need from plants, and they do this by

FEEDING

Look out for the [stars] and [circles].

15. The chain, the web, the pyramid

Different ways of looking at energy moving through living communities.

16. Nutrient cycles

An ecosystem depends on a constant supply of nutrients to all feeding levels in the system. If one level goes short, the whole system will eventually grind to a halt.

Feeding is just part of a continuous cycle which keeps Earth's limited supply of nutrients on the move through the biosphere.

(This way to explore change and balance in ecosystems)

(Ecosystems)

17. Population balance
Every living thing belongs to a population of its own species, and this population interacts with populations of other species to form communities. Look closely at the natural world and you'll find that it is in constant flux. As the availability of energy and nutrients changes, and other environmental changes happen, populations rise and fall....

18. Environmental changes

Species have evolved over millions of years, and are finely adapted to the natural changes in their environments.
But unusual changes disrupt ecosystems and disturb the populations which are part of the systems.

19. Populations together

The barn is a microcosm of the world outside - populations of plants and animals, constantly changing and influencing each other.
The size of any population depends on many factors, including:
· interactions with other species, as they compete for resources, and avoid predators
· interactions within the species, such as rivalry over territory.
Look into the barn to see how its residents affect each other.

20. How ecosystems grow

When a new environment is created, species of animals and plants will try to colonize it. Those that are successful create new opportunities for others. So ecosystems are dynamic, changing over time - sometimes rapidly and sometimes slowly.

(This way to see our growing impact on ecosystems)
21. Ecology

Once we understand nature’s web of connections, we can begin to recognize the ever-increasing impact that we are having on the world’s ecosystems. This is threatening all life forms, including our own.

Our destiny is tied to nature’s destiny. If we are to safeguard the future of life on Earth, it is vital that we learn to apply our understanding of ecology.

-467-
APPENDIX 9:

HEIGHT OF THE FIRST LINE OF THE TEXTS IN THE PANELS
IN THE ECOLOGY EXHIBITION, THE NHM

J. H. IGUCHI 1993

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\[ \begin{align*}
 n & : 20 \\
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 \bar{X} & : 172.45 \\
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 \text{MEDIAN} & : 190 \\
 \text{VARIANCE: } & 1153.28 \\
 \text{SD} & : 33.96 \\
 \text{SE} & : 7.59 \\
 \text{MEAN (95\%CI)} & : 172.5 \pm 15.2 \\
 & (157.3 - 187.7)
\end{align*} \]
APPENDIX 10:

PLACEMENT OF THE PANELS & NUMBER OF WORDS IN THE PANELS
IN THE ECOLOGY EXHIBITION, THE NIM

J. H. IGUCHI 1993

NOTE S1: sentence 1

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S2: 14  
S3: 22  (COMPOUND) | 47 |
|---|----------------|-----|----------------------------------|
| 6 | ENERGY         | 200 | S1: 18  
S2: 23 | 41 |
| 7 | THE BIOSPHERE  | 200 | S1: 11  
S2: 12  
S3: 22  (COMPOUND)  
S4: 18  
S5: 19 | 82 |
| 8 | ECOSYSTEMS     | 200 | S1: 16  
S2: 14  
S3: 7  
S4: 7  
S5: 4  
S6: 15 | 63 |
| 9 | THE WATER CYCLE| 125 | S1: 14  
S2: 15  
S3: 22  (COMPOUND) | 51 |
| 10| IN THE OCEANS  (on the inclined plane) | 100 | S1: 10  
S2: 23  (COMPOUND) | 33 |
|   | ON THE LAND (on the inclined plane) | 125 | S1: 7  
S2: 12 (COMPOUND) | 19 |
|---|--------------------------------------|-----|----------------------------------|----|
| 12 | ENERGY & SUNLIGHT                    | 205 | S1: 5  
S2: 10  
S3: 22 | 37 |
| 13 | THE LEAF FACTORY                     | 120 | S1: 12  
S2: 19  
S3: 9  
S4: 19  
S5: 7  
S6: 19 | 40 |
|   | ENERGY MOVES THROUGH LIVING COMMUNITIES | 132 | S1: 14 (COMPOUND)  
S2: 26 (COMPOUND) | 40 |
| 14 | WHAT ALL LIVING THINGS NEED (ON THE INCLINED PLANE) | 65 | S1: 21 (COMPOUND)  
S2: 11  
S3: 14  
S4: 19  
S5: 7  
S6: 19 | 72 |
| 15 | THE CHAIN, THE WEB, THE PYRAMID       | 190 | S1: 10 | 10 |
| 16 | NUTRIENT CYCLES                      | 170 | S1: 16  
S2: 14  
S3: 21 | 51 |
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APPENDIX 11:

NUMBER OF WORDS PER SENTENCE ON THE PANELS
IN THE ECOLOGY EXHIBITION, THE NM

J. H. IGUCHI 1993

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n : 50  SD : 5.25
ΣX : 671  SE : 0.74
X  : 13.42  MEAN (95%CI)
RANGE : 20(4-24)  : 13.42 ± 1.48
MEDIAN : 14        (12-15)
VARIANCE: 27.56
APPENDIX 12:

**NUMBER OF WORDS PER PANEL IN THE ECOLOGY EXHIBITION, THE NHM**

J. H. IGUCHI 1993

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n : 24
ΣX : 1092
X̄ : 45.5
RANGE : 72 (10-82)
MEDIAN : 44
VARIANCE : 278.08
SD : 16.68
SE : 3.40
MEAN (95%CI) : 45.5±6.8 (39-52)
**APPENDIX 13:**

**VLS (VISITORS' LENGTH OF STAY) IN THE ECOLOGY EXHIBITION, THE NHM**

J. H. IGUCHI 1993

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(1) Visitor density in the Ecology Exhibition defined by this author can be divided into 3 as follows:

Less crowded: the number of visitors on the ground floor is up to about 10.

Fairly crowded: the number of visitors on the ground floor is about than 10, and they can view exhibits without forming a long queue.

Very crowded: visitors can view exhibits with difficulty because of crowding. Sometimes they must wait for viewing one object for more than one minute.
### [A] DISTRIBUTION OF WHOLE DATA (MINUTES)

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| FAMILIES | :20 |
| GROUPS | :30 |
| MALE SOLITARY VISITORS | :25 |
| FEMALE SOLITARY VISITORS | :25 |
| TOTAL | :100 |

<15 MINUTES: 64%
15-30 : 30
31-60 : 6
60> : 0
### Analysis of the Difference Between Solitary Visitors and Groups

#### (Minutes)

**<Solitary Visitors>**

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- **N**: 50
- **X**: 13.1
- **Range**: 4-34 (30)
- **Variance**: 57.25
- **SD**: 7.57
- **SD (Population)**: 7.84
- **SE**: 1.08
- **Mean (95% CI)**: 13.1 ± 2.16 (10.94-15.26)

- **ΣX**: 655, **ΣX²**: 11443
- **(ΣX)²**: 429025

#### <Groups>

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- **N**: 50
- **X**: 14.92
- **Range**: 4-49 (45)
- **Variance**: 77.03
- **SD**: 8.78
- **SD (Population)**: 8.87
- **SE**: 1.25
- **Mean (95% CI)**: 14.92 ± 2.5 (12.42-17.42)

- **ΣX**: 746, **ΣX²**: 14982
- **(ΣX)²**: 556516

#### <t-test>

- **t**: 1.1, **df**: 98, **P > 0.2**
### Analysis of the Difference Between Males and Females (Minutes)

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### Females

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### t-test

\[ t = 2.088; \text{df} = 48; P < 0.05 \]
APPENDIX 14:

AP (ATTRACTION POWER) & HP_r (RATING HOLDING POWER) IN THE ECOLOGY EXHIBITION, THE NHM

25 (THU), 29(MON), 30(TUE) NOV 1993, 1 (WED), 7(TUE) DEC 1993: FAIRLY CROWDED (1)

(1) SEE APPENDIX 13

J. H. IGUCHI 1994

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**Ecosystems (Sec.)**
- **Mean**: 8.4
- **Range**: 5-30 (25)
- **Median**: 5
- **HPr**: 1.0%

**The Leaf Factory (Sec.)**
- **Mean**: 20.3
- **Range**: 5-135 (130)
- **Median**: 10
- **HPr**: 2.4%

**The Web (Sec.)**
- **Mean**: 27.4
- **Range**: 5-175 (170)
- **Median**: 20
- **HPr**: 3.2%

**Bulldozer (Sec.)**
- **Mean**: 24.3
- **Range**: 5-75 (70)
- **Median**: 22.5
- **HPr**: 2.9%

**Films (Sec.)**
- **Mean**: 22.7
- **Range**: 5-80 (75)
- **Median**: 15
- **HPr**: 2.7%

HPr = MEAN / VLS (%) (VLS = 850 sec.), VLS (visitors' length of stay in the gallery).
APPENDIX 15:

ECOLOGY QUESTIONNAIRE  NOV 1993

1. Why did you come to the ECOLOGY exhibition? Please tick one.
   a) I just happened to see it in passing.
   b) I read about it somewhere.
   c) Somebody told me about it.
   d) Others:

2. What do you think?
   a) Labels used : easy  hard
       1  2  3  4  5
   b) Amount of information : few  many
       1  2  3  4  5
   c) Spoken words : clear  confusing
       1  2  3  4  5
   d) How to find your way clear  confusing
       around
       1  2  3  4  5
   e) What age is this children  adults
       exhibit best suited for ?
       1  2  3  4  5

3. Seeing photos of sections of ECOLOGY, please answer the following questions.
   a) Which section did you like best?  No.
   b) Which section did you like least?  No.

4. Was the ECOLOGY exhibit stimulating or boring?
   stimulating  boring
   1  2  3  4  5
5. Do you think that the last section "Human impact on the environment", was effective?

   1  2  3  4  5
   no a little more or less quite effective very effective

6. To what extent, are you prepared to change your life style to help "Save the Earth"?

   not at all a great deal
   1  2  3  4  5

7. Whose future responsibility is it to "Save the Earth"? Please tick only one.
   a) Government b) employers
   c) conservation groups d) individual persons

8. If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it? (1)

   definitely no definitely yes
   1  2  3  4  5

9. About yourself:
   a) sex : 1) male 2) female
   b) age : 1) 10-20 2) 21-30 3) 31-60 4) 60+
   c) education : 1) secondary school (up to 16)
                   2) sixth form college (up to 18)
                   3) first degree
                   4) higher degree

Thank you very much indeed for your time. JACK IGUCHI (BA,MA)

(1) This is a leading and hypothetical question which normally should be avoided (see p145), however it was asked intentionally (see p361).
Office use only (for questionnaire and quiz)

Date :
Day of week :
Time of day :
Visitor density : very crowded
               fairly crowded
               less crowded

single visitor
family group  (#  )
friendship group (#  )

<FOR QUIZ>

[1] sex       : 1) male  2) female
[2] age       : 1) 10-20  2) 21-30  3) 31-60  4) 60+
[3] education : 1) secondary school (up to 16)
               2) sixth form college (up to 18)
               3) first degree
               4) higher degree

[4] answer

1. a( ), b( ), c( ), d( )
2. 1)  2)  3)  4)
3. 1)  2)  3)  4)
4. 1)  2)  3)  4)
APPENDIX 16:

ECOLOGY QUESTIONNAIRE NOV 1993

1. Why did you come to the ECOLOGY exhibition? Please tick one.
   a) I just happened to see it in passing.
   b) I read about it somewhere.
   c) Somebody told me about it.
   d) Others: I HAVE ALWAYS WANTED TO COME

2. What do you think?
   a) Labels used : easy hard
      1  2  3  4  5
   b) Amount of information : few many
      1  2  3  4  5
   c) Spoken words : clear confusing
      1  2  3  4  5
   d) How to find your way clear confusing
      around
      1  2  3  4  5
   e) What age is this exhibit best suited for?
      children adults
      1  2  3  4  5

3. Seeing photos of sections of ECOLOGY, please answer the following questions.
   a) Which section did you like best? No. 1
   b) Which section did you like least? No. 5

4. Was the ECOLOGY exhibit stimulating or boring?
   stimulating boring
   1  2  3  4  5
5. Do you think that the last section "Human impact on the environment", was effective?

1 2 3 4 5
no a little more or less quite effective very effective

6. To what extent, are you prepared to change your life style to help "Save the Earth"?

not at all a great deal
1 2 3 4 5

7. Whose future responsibility is it to "Save the Earth"? Please tick only one.
   a) Government
   b) employers
   c) conservation groups
   d) individual persons

8. If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it?

definitely no definitely yes
1 2 3 4 5

9. About yourself:
   a) sex : 1) male 2) female
   b) age : 1) 10-20 2) 21-30 3) 31-60 4) 60+
   c) education : 1) secondary school (up to 16)
                        2) sixth form college (up to 18)
                        3) first degree
                        4) higher degree
   d) Nationality: UNITED

Thank you very much indeed for your time. JACK IGUCHI (BA,MA)

Recycled Paper
Office use only (for questionnaire and quiz)

Date : 21 (FR) Jan '94
Day of week : FR
Time of day : 12.13 - 12.35
Visitor density :
  very crowded
  fairly crowded
  less crowded

single visitor   Female
family group  (# )
family group  (# )

<FOR QUIZ>

[1] sex : 1) male 2) female
[2] age : 1) 10-20 2) 21-30 3) 31-60 4) 60+
[3] education : 1) secondary school (up to 16)
  2) sixth form college (up to 18)
  3) first degree
  4) higher degree

[4] answer

1. a( ), b( ), c( ), d( )
2. 1) 2) 3) 4)
3. 1) 2) 3) 4)
4. 1) 2) 3) 4)
APPENDIX 17:

TRANSCRIPT OF THE GALLERY INTERVIEWS
IN THE ECOLOGY EXHIBITION, THE NHM

From December 1993 to February 1994, 100 gallery interviews in the Ecology Exhibition, the NHM in terms of the Exhibition as well as environmental awareness were conducted by J.H. Iguchi, this researcher. The content of the interview was as follows.

1. Did you find any parts of this Exhibition particularly interesting?
2. What do you think is the basic message of this Exhibition?
3. In your opinion, does this Exhibition need to be improved? Why? In what ways?
4. Have you ever taken part in any events on environmental issues?
5. Is there anything else you would like to comment on about this Exhibition, or indeed environmental issues in general?

NOTE: following abbreviation, numbers and terms will be used in the transcript:

a) Ed: the respondent's educational background. For example, (Ed: up to 16) means educated up to 16 years old.
b) (1), (2) ... : the order of the interviews.
c) Middle-aged: from 31 to 60 years old. Elderly: over 60 years old used in this thesis only.

The transcript comes from original tapes recorded which might include some grammatically incorrect sentences and slang.
I am now going to start the interviews in the Ecology Exhibition, the NHM on Saturday 18 December 1993, 11.33 am.

(1) British male in his twenties with his son (Ed: up to 18)
   1. The leaf factory
   2. —
   3. Not really...I like it. In the last bit on human impacts and the environment, I did not find very clear.
   4. No.
   5. I thought the exhibition was very interesting...some of the sound effects were very good.... I like the bit at the end...the things that pop up...the turtles, when they come up and go down again...very well presented.
      I think this question is very old whose responsibility....

(2) Middle-aged British male with his 3 daughters (Ed: MA)
   1. Ecosystems
   2. (unclear)
   3. Don't know.
   4. No.
   5. I think you should have someone there all the time to ask question, an opportunity to explain to people...teaching people....

(3) Polish female in her late teens (working in London) with her boy friend (Ed: up to 18)
   1. (too quiet - incomprehensible the whole interview)
   2. —
   3. —
   4. A member of Green Peace in Poland.
   5. Too noisy - cannot hear information about....
(4) British female in her late teens (Ed: 1st degree)

1. —
2. I don't know.
3. No.
4. Yes...demonstration.
5. No...the Government should do something and everyone themselves have to do something, but we should have more support from the government.

(5) Middle-aged Singaporian male with 2 his children, a boy and a girl (Ed: Higher degree)

1. They are all interesting...very clever use in a small space. The impact was good for young children.
2. Recycling.
3. From an adult's point of view...not much. From a child's point of view some of it are too complex for a child to understand. Maybe some for older...must teach the children ...so when they grow older they will save the earth.
4. Yes I am a diver and we save corals...we transplant corals to another place...we take the coral and transplant it.
5. I think the message is for an adult but for a younger child there are too many words...and I think a child of 6 years old will not understand. In Singapore, environmental issues are all well...people grow up recycling but the message here is different.... My own views are...I am a environmentalist, conservationist...this exhibition should be directed more to children.

(6) Pakistani male in his teens with his uncle (Ed: 1st degree)

1. Mainly ecology side of it, the feeding and how animals live...that was more interesting.
2. Basically how to preserve the planet.
3. There were aspects...seem to be very static...if there were more moving things you would see exactly how...what effect humans have on the plants and animals, but at the moment you press something and you see a light come up. It's not so involving. Maybe if there was a moving object...

4. No.

5. Exhibition was very good. (about) environmental issues I wouldn’t like to comment.... It's not something I have really focused on.

(7) Middle-aged British male on crutches with his wife and 2 female children (Ed: up to 18)

1. I am interested in the ocean science...oceanography so I tend to learn that way.... I am genuinely interested in the oceans.

2. The dying planet...yes it will die.

3. I don't think so...it's very effective for its explanation of certain aspects for smaller children...(they) would get there attention...like the model of the world with the greenhouse around it...a child would understand that.

4. Oceanography conference in Brighton.

5. ...I think the government should take more interest in the people as people would change it if they had more power.... I think most people think that the Government will do exactly what it wants to do irrespective of what you and I think...there is little democracy in the Government.

(8) British male in his twenties with a child (Ed: up to 18)

1. Yes, the bulldozer a bit.

2. If we don’t wake up, we are going to destroy the world....

3. The only way it could be improved is to be made larger.

4. No.

5. This exhibition is good and its message is carried on further in we

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might get somewhere. It's a good start. It's bad...it's getting worse every minute.... It's good we are doing this but it is only one sector that's doing it...not the employer and the big multi-nationals...they will carry on polluting the world.

(9) British male in his late teens (Ed: up to 18, and going to university)
1. The mirrors and televisions...made it very interesting...very impressionable.
2. Ecological...the nature in general and upstairs there was the greenhouse effect...very well done....
3. No...it's hard to tell. If I had seen a better exhibition I could say but I can't say.
4. No not taken part...not actively but passively.
5. Comment in general...very well. I think there is individual responsibility...change their attitudes and change the ways of the world depend on the individuals...(who) are influential to the Government and employers and conservation groups, so it all stems from the individual.

(10) Middle-aged British male (Ed: up to 16)
1. One part where you were shown all the mirrors and you were looking at the .... This part was the best...very interesting...big impact.
2. The way we have to keep the balance. Explains all the changes and the links....
3. No, I Don't think so....
4. Green Peace bike Richmond to Windsor...I would have done it this year....
5. Not really...I didn't spend enough time in there. Things seem to be clearing up....

(11) British male in his teens (15 years old), (Ed: up to 16)
1. The animals and what food they eat.
2. Help the environment.
3. No not really.
4. No.
5. No.

(12) Japanese female in her twenties with a boy friend (Ed:1st degree)
1. Water cycle.
2. Human impacts on the environment.
3. It's OK.
5. It shouldn't use too many wrapping papers for goods and avoid using wooden chopsticks although they are made of pruned branches but....

(13) Middle-aged British male with his daughter (Ed:up to 18)
1. Yes the ocean area...with the telephones. In going through this form you should bear in mind I have taken into consideration my daughter. The water circle had quite an impact....
2. I think it is informative in terms of taking it through the ecology cycle and what it means to you and the world generally.
3. I think it depends on who it is aimed at. My daughter is 10 years old and she was keen on some parts but keen to press others. It is difficult as it is there for everyone and all different ages and interests, so it isn't easy to cater for everyone.
4. Not recently but in the past I have helped to organise Friends of the Earth local group but that was about 10 years ago.
5. I found it difficult to answer your question about whose responsibility it was to save the earth. I felt it implied to individual persons and the Government, and (it) depends (on) who has the most power to do something about it, and I think both as individuals and the government have power, and it is a matter of balance although the government has
more power. There are many issues and ...we sometimes come up with environmentally solutions which do not always turn out...environmentally friendly. I think there is a need to control the excessive of man... there is too much car travel and there should be more resources put into public transport in my view. There is a need for the Government to control the excess of industry in exploiting the country.

(14) Elderly (nearly 80) British male (Ed:up to 18)
1. Was all most interesting...I think the earth when you come in the door.
2. Hole in the earth...the environment...people use so much sprays and petrol which goes in the atmosphere which we all have to breath in...90% of the cars only have on person (each), just to go 200 yards to get a newspaper...they don't walk, they get in the car. All that is going in the air and it will effect people.... Look at people with asthma...it can't do you much good...it's increasing every year.
3. I think it is a very high standard. Improved from 20 years ago...not a place you would bring your children...now it's much better.... Lighting's good, atmosphere's good...100% improvement.
4. No.
5. Only environmental issues I have is what I've just mentioned...carbon dioxide...nothing's been done about it...90% (of) one person driving a ...big car...that's what I'm against...get the public transport (is) better and they wouldn't need to use their cars so much.... People will never give up their cars but I think they can use them less, that's my opinion instead of using them.... Five minutes walk...but jump in car... pollute the air. In Japan there is even more pollution...they wear masks all the time don't they (NOTE: In fact, wearing of masks has a variety of purposes, not least to help warm or avoid transmitting germs as well as avoiding inhalation of pollutants).
(15) Japanese male in his late teens (Ed: up to 18)
1. The water cycle and ocean.
2. Stuffed animals and photos shows natural world.
3. You may as well reconstruct it bigger and show more information.
4. Yes, in school, the 1st and the 2nd years in England, I studied the environment and then collected rubbish papers.
5. I saw the photo exhibition of wildlife in the NHM just before. Of the photos, one orang-utang squats in a jail-like cage in the zoo, and I felt it was pity. We want to see real animals but it is unfair to keep them in the zoos. I don't want to go to the zoos keeping the animals because we humans belong to the same animals.

(16) Middle-aged Portuguese female with her daughter (Ed: 1st degree)
1. I think it is all interesting.
2. There must be a balance with men and animals.
3. Everything needs to be improved but it is OK.
4. No.
5. No, it's OK...it is the first time I saw one of these exhibitions...too complicated the issue.

(17) Elderly American male (Ed: Higher degree)
1. I thought it was overall interesting.
2. Informational without any message...educational in seeing what there was to see in the exhibits...about the ecology.
3. Anything can be improved.
4. No.
5. I think governments are going in the right direction on the environmental issues in particular pollution. I think (in) particular about Siberia in the oil fields...where the exploitation began and was extreme and how they have to do something. Whereas in Alaska in the oil fields where you
have great protection of the environment. In the US you have the oil pollution which I think has gone too far in regulation.... There are some of the things I have seen in the last 2 years. I came in here by change...I was going to Victoria & Albert Museum but it was closed.

(18) Middle-aged British male with his son (10 years), (Ed: up to 16)
1. Food chain.
2. We are destroying the world and we have got to try and save it individually.
3. I think this only breaks the surface and there are a lot of things you cannot show, and if you could show them it would make it a lot more interesting.
4. No.
5. No.

(19) Middle-aged British female with a her daughter (Ed: up to 16)
1. Yes the water.
2. I think it tells you all about the environment and how to save it.
3. No I don't think so...I found it interesting.
4. No.
5. I am a little worried about the ozone layer but I don't really know what the answer is.

(20) British female in her late teens (Ed: 1st degree)
1. I found the section on feeding with the tiger and also the life cycle of the rabbit...that was funny.
2. I think it is to reinforce the human part of ecology and (it doesn't) separate from it (the environment) and we are actually belonging to the environment.
3. Maybe a little more complicated explanations...I spoke to the children in
the exhibition but maybe some additional information are a little more complex.

4. Yes, I joined Green Peace at one stage.

5. I think the environmental issues should be seen as an ongoing issue and ...it may seem that the environment goes in fashions and fades and may last a couple of years and die down.... It should be more ongoing and more part of our every day life.

(21) Middle-aged American female with her daughter (baby) (Ed:Higher degree)

1. I like the part about the changing earth...where the bits bobbed up and down...I liked the...environmental changes.

2. I guess it's to give people information about how things work... different ecosystems, and how they work together, and how it's been changing over the years due to human impacts as well as changes in nature.

3. (no clear)

4. Yes, I have...I don't live (here) I live in the United States.

5. I think it was difficult to get in with a 5 years old child.... I would have liked to spend more time looking at but.... I don't know...make the exhibits more understandable by younger children. Maybe (it) has certain parts of it that are designed for younger children...the rabbit one she liked, it was easier for her to understand and the pictures to look at. She got a little scared going through the whirlpool part...she didn't really want to go in there.

(22) British male in his twenties (Ed:up to 18)

1. Yes I did I found the nitrogen cycle...the water cycle (are) very interesting.

2. When I went to see it, I was impressed the way it covers pretty much every aspect of cycles...nitrogen cycles, water cycle, everything that
goes to making the earth and how it works but I thought that the section of the human impacts on the environment (was) not satisfactory.... A lot more could be done.

3. Yes,, the human impacts.
4. Not really...I study ecology and politics at colleges so we do (know) a lot about the human impacts on the environment...especially regarding health and pollution.
5. I think the exhibition was visually excellent and easy to use... All I could say for improvement would be to add more about human impacts and explain population balance.

(23) Middle-aged British female with a male partner (Ed:1st degree)
1. We enjoyed the water cycle.
2. Each individual’s responsibility to do something to help the environment.
3. No, I thought it was very well balanced.
4. No.
5. I just thought it was fascinating how well it was put together to involve the audience and the subjects being done.... It was very well done....

(24) Mexican male in his twenties (Ed:Higher degree)
1. Yes, it is interesting but I prefer another kind of message.
2. Save the earth.
3. It’s OK.
4. No.
5. There is a lot of spoken words and you do not have time to listen to every record so I would (like to) have less spoken words.

(25) Japanese male in his twenties (Ed:up to 18)
1. TVs and AV effects are better than writing information.
2. Don’t destroy nature, but culture and modern technology are against the
nature. It is good idea to stress on this relationship between these to conserve the nature.
3. Human impacts must be emphasized.
4. No.
5. You should prepare pamphlets using some languages.

(26) Middle-aged South African male with a female (Ed:Higher degree)
1. Yes, the water cycle...the life cycle.
2. That's if all don't start thinking about ecology, we won't have an earth left.
3. I think it's fantastic.
4. I'm a South African and we are very concerned about the environment.
5. I think it's wonderful that you are so concerned about the environment.
   The problems we've got in South Africa...(is that)...we've got major environmental problems...bigger than South America.

(27) British male in his twenties (Ed:Higher degree)
1. Particularly the water...and the actual exhibition was actually great.
2. The environment and man's impact on the environment.
3. No.
4. Yes.
5. No, not really. It was all covered.

(28) Middle-aged Malaysian male with a female (Ed:1st degree)
1. Some of the exhibits are more interesting than others...for example, the end section I liked the best.
2. The message is for man to protect the environment and also the result of that protection...the result would protect man in the long run.
3. Certain exhibits with narration...some sound system (are) not clear enough.
4. No, not yet.
5. I suppose (that) a lot of people...the public...expect the Government to lead the way to protect the environment...normally they would not change their life-style. So I suppose if you...teach the public, you have to teach them from very young...primary school. As you grow older, life-style and habits are very hard to change.

(29) British male in his late teens with a female (Ed:1st degree)
1. I find all of it (are) very interesting...it remind me of my GCSE geography exhibitions.
2. About the planet we live in...general information.
3. Not much if your knowledge is advanced in ecology.... It's all right for a school kid...if they are studying.
4. No, I haven't.
5. No comment.

(30) Middle-aged British male with his baby (Ed:1st degree)
1. The land.
2. There is a quote up there...I can't remember how it goes...how the earth links together...it gives you a holistic view.
3. Myself no, but he found it a little spooky (that) he actually wanted to get through it faster...there was too many dark spots in it...didn't see it as thoroughly as we should. I think the presentation of the caption is a little vague...you had to search for them amongst the glass.
4. Yes...road campaign.
5. I expected to see something more on re-cycling...it was all about natural recycles. I thought it might be a bit wider.

(31) German female in her twenties (Ed:1st degree)
1. Actions of energy and cycling.
2. I think that the people understand the world...living and problems of pollution and the circles.
3. I think the possibility of telling the people how to change or to say what they can do in their own lives, so the future will be better.
4. I study biology in university...so only in university.
5. Exhibition is very professional.

(32) Middle-aged Australian male with his baby (Ed:1st degree)
1. Water cycle and man's impacts on the environment.
2. I guess the overall message (is) we need to conserve our environment and be aware of what we have and what we may lose.
3. I suppose it could be improved but it is complete. I believe (they are) perhaps something more about what an individual might achieve by recycling or being more careful of the resources, not wasting resources...something like that.
4. I am a professional in environment protection for the Australian Government.
5. Only that the exhibition was very good, well thought out and organized, logically clear and very good used of audible aides and modern technology, and perhaps if the end (human impacts) could have a strong emphasis on what the individual could do. I believe environmental issues are becoming more and more important as people are becoming more and more aware of the need to conserve resources and I suspect they are no longer as politically important as they were, because of the recession.... For example the Greens were very strong in Australia, America and Europe... (but) now we are in a recession. In the Third World, Indonesia and Malaysia, the Greens have never been very strong while the economy is still developing...chopping down the trees and so on. Somewhere there has to be a balance.... I think we have gone through a peak...the economic recession has brought about the reservedness in relation to
ecological issues because it costs money or reduces profit whatever. But now things should be picked up and things should be returned, although I don’t think we will ever reach the peak for a long time but I think as we come out of the recession, people will again increase their attention to ecological issues and conservation.

(33) Israeli male in his twenties (Ed: up to 18)
1. All the feeding parts…chain…animals and barn community.
2. How to save the environment... how to keep it clean... what to eat... how we should change our lives a little bit.
3. No, not at all.
4. No.
5. I think it is a shame what is happening to the world... everything might be true, it’s a shame... we’ve all got to think about changing our lives. I think the exhibition was great.

(34) Elderly Brasilian male with 2 females in their twenties (Ed: 1st degree)
1. Yes...the animals, flowers, pictures.
2. —
3. No.
4. —
5. No, I think it is very nice and interesting... you can get information.

(35) Singaporean male in his twenties (Ed: 1st degree)
1. I’ve seen others…it is OK…not enough information about what we are doing indirectly... I think that is very important....
2. You must be a part of it and if you destroy it you destroy yourself.
3. (unintelligible – tannoy system came on at the same time)
4. No.
5. We must do things individually but also we must do everything together.
(36) Middle-aged British male (Ed: 1st degree)

1. I liked the design of the exhibition...the architecture.
2. If human beings possibly slow down a bit, and use the world's resources more wisely as we go into 21st century.
3. Basically OK but a bit difficult for children to understand and they are the most important.
4. No.
5. Is this a permanent or temporary? It should be enlarged in more detail .... It doesn't have to be in this museum but in the Science Museum. I think fuel or energy source...alcohol or solar power or something will propel cars in a different manner than gasoline.

(37) German male in his twenties with a male friend (Ed: up to 16)

1. For young people, the rabbit...he died.
2. Ecology...basic safety.
3. No, it's OK.
4. No.
5. I like it to be more information to read.

(38) Middle-aged British female with her husband and a her child (Ed: up to 16)

1. Yes, I did...some more interesting than others...in particular the animals...feeding the animals and the effect on different species.
2. Make people realize that everything man does, it effects (on) other things... We got the power of life and death. In zoos, "animals", if they become extinct we've got to look after them.... "Man", it's in our hands...the destiny of the earth...that's the message.
3. No, I think it's very good.
4. No.
5. Not really.
(39) Elderly British female (Ed:higher degree)
   1. Not anything in particular.
   2. That we have to do something about ecology...be aware.
   3. It can always be improved but it's quite good stuff for the first time I went to it.
   4. No.
   5. I think it should be more stressed and publicized. I think, more ought to be done about it in schools, making people aware. If we don't do anything we are not going to have anything left for the next generation.

(40) Middle-aged British male with a male friend (E:up to 18)
   1. The water circle from the technical point of view was very striking....
   2. Simply to raise awareness of what is actually going on around us.
   3. We went through it reasonably quickly. I have covered some biology parts in the past through other courses, so I tended to skip things, and I should say perhaps yes (improve), but I could not be sure and say clearly exactly what.
   4. No.
   5. Not really...I think it is important that such exhibitions are held and shown as it is necessary for individuals to be made aware at every opportunity. I am very much interested in it but I tend to worry about...there are so many other people and businesses who intend to make a profit and muck up the environment...by products.

(41) Middle-aged British male (Ed:1st degree)
   1. All interesting.
   2. People can make a difference...people have to contribute to ecology.
   3. That's a tough one.... I would like to see an exhibition showing the use of resources....
   4. No.
5. Not really. I am very concerned about it...not many people are....

(42) Middle-aged Mexican male (Ed:Higher degree)
1. I like the water cycle.
2. The cycle of life.
3. Yes, I think it could be improved by more models of examples.
4. No.
5. (no clear)

(43) Japanese female in her twenties (Ed:1st degree)
1. The models of earth including a ratio of land and ocean.
2. To conserve the earth.
3. The last section human impacts on the environment should be more stressed.
4. No, but in my house, rubbish has been separated into some kinds to be recycled.
5. For both adults and children, it should be considered. Only individual person's effort can save our environment.

(44) Swiss male in his twenties (Ed:1st degree)
1. Water was clean...interesting biological chains.
2. Make (people) understand necessarily...something at an individual level to help environmental issues.
3. I find it very good....
4. No.
5. I've seen in other sections there are a lot of interaction...playing games...maybe make it more interesting for children...playing...experimental section, it is better for the understanding. I think what we could do for the environment...would be interesting to help third world situation.... If you don't have economic problems you will be able to think about environment but if you have economic problems you cannot think about it...
not easy to improve....

(45) Middle-aged Australian male (Ed:1st degree)

1. Recycling and TVs.
2. Whole range of factors that effect the earth and the impact (tannoy)....
3. I thought it was excellent.
4. No.
5. Very clearly set out. Visually, very interesting ...a credit to the museum. In Australia, environmental issues are getting more and more important. We have lots of environmental groups that are quite active and I think people are becoming more aware. Particularly on the coastal areas...forest and natural parks are having fires.

(46) Middle-aged Greek female with a male child (Ed:MA)

1. The water....
3. Always, can be improved...cannot specify.
4. No.
5. No.

(47) Middle-aged British male with his child (Ed:up to 18)

1. Not specifically.
2. The future of the environment.
3. I don’t think so. I think it’s excellent.
4. No.
5. No, I’m quite happy with it. I haven’t considered environmental issues.

(48) British female in her twenties (Ed:up to 18)

1. I liked the environment...the human impacts.
2. We are more or less responsible for what happens now.
3. No.... There's quite a lot to take in. This is my second time because there was not enough time to take it all in.

4. No.

5. I didn't know it was here when I got here, so it is not very well advertised.

(49) Portuguese male in his twenties with a female (Ed: lst degree)

1. The sea.

2. Basic education for children who do not know anything about ecology and the environment and maybe some....

3. Good for children...very important to teach them.

4. No.

5. I would like to see this exhibition in my country.... I liked it. ...we are not caring enough...people use ecology to get something else...people are using ecology with other objects....

(50) Middle-aged British male with his daughter (Ed: up to 16)

1. Basically an informative experience.

2. Makes individual think about the environment...the earth's environment and the future.

3. I think all exhibitions need to be refreshed on a constant basis.

4. No.

5. Not really. I think most people...its this generation (pointing out his daughter) ...needs to protect it (the environment) for future generations.

(51) Middle-aged British male in his late thirties with a male friend (they are like hippies), (Ed: up to 16)

1. Rain forest.

2. Ecology...tells you how we can improve things in the future.

3. Not really improved...can have a bit more...more effects to attract people
...to wise them up and get them more involved.

4. No.

5. Very good...I liked it. Just getting worse all the time...it's up to us to make it better.... There should be more things on it...like advertisements and such...to get the message across the people.... They (people) can recycle.... It's (for) their children and their children's children that's going to benefit from it, if we start look after things now.

(52) Middle-aged British female with her daughter (8 years old), (Ed:up to 16)

1. The life cycle of the rabbit. For me personally I brought my daughter here aged just 8 and that was for her easy to understand and a good illustration. She can go home with that picture in her mind...fairly short but for her age she can remember that...not too complicated.

2. It is important that the cycle is allowed to continue without humans' changings it.

3. No, because if I criticized it (from adults' view) maybe...Amanda (her daughter) did not understand everything. But for an older child it could be boring. Perhaps possibly you make sure you repeat the message you are trying to put over in the exhibition...(so) different age groups and younger children can understand it and you don't miss anything vital because the words are too complicated to understand (for younger children).

4. No.

5. Only what I just commented...most people here have brought children so they are looking for good explanations for their particular aged child so you've go to have something for everybody, (so) they will pick up.... (When) next time they come, they might be a year older and they might skip something that may be childish to them and go onto something, a little more difficult (ones) that (they) can understand. I think you have (to)
put forward how we can make an effort to allow the cycle to continue (which) I liked it very much.

(53) Middle-aged British female (Ed:up to 16)
1. The models of the barn community...the sculpture of the green man and also the environmental changes.
2. The fact that we have to take care of our environment and that we have to preserve it.
3. No, I think it’s very good.
4. No...only that I’m a teacher but I haven’t actually been on a demonstration.
5. ...I think it should be slower. People can go through it too quickly and they should...slow down but I don’t know how...that’s your responsibility. I think it’s extremely important. I think we’ve got to work towards it and pressure our Government in order to do something about it.

(54) Middle-aged New Zealander male (Ed:Higher degree)
1. Carbon cycling and photos.
2. I think the basic message is the interconnection between the biosphere, the animals, the nutrient cycles and the atmosphere.
3. Personally I would like to see something on a more technical level and perhaps the impact of human beings on the environment.
4. No...I follow environmental issue only.
5. ...I think it needs to be directed politically and (by) some of the environmental organizations.... Like recycling, everyone should make an effort, but I think...a fringe group may not have much relevance to (do so).

(55) Middle-aged Israeli female with her daughter (Ed:1st degree)
1. The sun...the ecology.
2. We are the people (who have) responsibility for the ecology...to protect it.
3. Yes...parts of (the) protection (of the nature using) models (are) very small.
4. No.
5. We need to do something about the ecological issue.

(56) Argentine male in his teens (about 15), (Ed: up to 16)
1. The section that shows the human body (greenman), (and) the leaf factory.
2. That the people have to take care of plants.
3. No.
4. No.
5. I think it's very good.... Put messages in other languages. I have no message...only to take care of the cows.

(57) British male in her twenties (Ed: up to 16)
1. The farm yard was very interesting...especially the farm animals.
2. Basically it's about the environment and you have to take care of it.
3. No.
4. No.
5. No it's fine, good. I think that things have to (be) changed and we should do something about it...we are heading down a difficult road if we carry on the way.... Something has got to (be) changed.

(58) American (mixed Japanese and Chinese) male in his twenties with a male friend (Ed: Higher degree)
1. I liked the leaf factory.
2. We have impact on our environment and we can't just blindly abuse it.
3. It might have more consequences of our actions...it does not show much of the impact...of our ozone layer.
4. No.

5. We are definitely abusing the environment and we should be aware of it. It's not easy.... I abuse it myself by just driving my car.

(59) Elderly British female (about 60), (Ed: up to 18)

1. Yes, the world...the sea.

2. We should look after the earth properly.

3. No, not really.

4. No.

5. (unclear)

(60) Middle-aged Norwegian female (Ed: Higher degree)

1. (unclear)

2. The cycle.

3. Should be more effective.

4. Yes, in Norway in two weeks holidays.

5. ...People (do) not clean up after (using)...paper and plastic...very much...throw away...everything.... Society have no room for other things....

(61) British male in his twenties (Ed: 1st degree)

1. The ecology...the cycle.

2. To conserve the environment and look after it.

3. Ideal for children...it might.... I suppose you cannot do (for) both (children and adults).... Could be more information.

4. At college.

5. Very good for younger children...quite simple for them to understand...good for groups of school children. This type of thing needs to be shown more often to make people aware of what governments aren't doing...and it should be free.... (If) pay for it, (it) could deter some people.
(62) Hungarian female in her twenties (Ed: 1st degree)
1. Nearly everything...the leaf part (is) very interesting.
2. We have to save the earth.
3. No.
4. Yes.
5. No.

(63) Middle-aged British male with a daughter (Ed: up to 16)
1. The science.
2. Try (to) get over to people what the earth is like.
3. No.
4. No.
5. Basically to save the earth and governments have more power than individuals.

(64) Middle-aged British male with his family (Ed: up to 18)
1. ...I did like the energy side...the earth’s energy as I work in the energy industry.
2. We only have one world and it’s...not to be plundered and it’s...all interactive parts...all species (are) interactive.
3. I have two children and youngest (was) bit bored.... For me personally (if) less noise and more time, they loved it....
4. No.
5. ...there’s so much to say.... As a personal view I work in an industry that exploits the earth. We try very hard to ensure we minimize the damage but I think it’s everyone’s responsibility...especially for the children.... My daughter tells me off now when I don’t recycle...so basically it (the information) comes down on education and (then) everyone (will) has got moral sense and responsibility.
(65) British male in his twenties (Ed: 1st degree)
1. ...the public awareness of the ecosystem which is particularly relevant.
2. Look at the surrounding environment. Look how it has (been) developed over the years and possibly learn ways how you can carry on...developing without ruining the whole system.
3. No...more or less covered everything...not too much information.... The information is about right.
4. Unfortunately not.
5. The displays in the cabinets were not so clear. We have got to be careful and this exhibition highlights the fact that if we are not careful, we are going to ruin the system....

(66) Japanese female in her late teens with a Brazilian female with her 2 children (Ed: 1st degree)
1. Beginning...the atmosphere.
2. We can understand the system of the earth and what man is doing with the environment involving the animals and the plants.
3. I was very surprised with the technology...see these items.
4. No.
5. I was very surprised. I think we must take care of the environment because we are parts of the system, then we can teach the effect of our own action (to others).

(67) Middle-aged British male with a female friend (Ed: up to 16)
1. Yes, the animals.
2. To make people aware what's going on around them.
3. (unclear)
4. No.
5. What I have seen of it so far...is good. If it was up to me I would like to (show) more things done to make people more aware.
(68) Japanese male in his twenties (Ed:1st degree)
1. A rabbit's life.
2. Humans are also parts of the nature.
3. It should be extended more.
4. No.
5. This seems to be made for children but isn't for just fun for children, but the design was carefully planned for each small part. It might be too late to recover our environment, but we mustn't destroy it anymore, and children should be educated by like this exhibition to save the planet.

(69) American female in her late teens (Ed:1st degree)
1. Human impacts on the environment.
2. Human impacts on the environment.
3. No.
4. No.
5. I thought...it had a good point and very good for young children. It's an issue (in all) over...the world not just (in) USA. We come from California.

(70) Middle-aged South African female (Ed:1st degree)
1. Water cycle and the bulldozer.
2. To get people more involved in conservation. We've only got one earth and we should look after it.
3. I think the preservation of the sea.
4. In South Africa, there's not much of that at the moment.
5. I enjoyed it...the whole thing is outstanding. I think the population explosion is going to have a big effect on the environment... I think it's a world-wide (problem).... They are cutting down trees to build more factories for work.
(71) British female in her twenties with a female friend (Ed: up to 18)
1. The rabbit.
2. How the ecosystem goes on.
3. No...it’s fine.
4. No.
5. It’s alright.

(72) Middle-aged British male with his daughter (Ed: up to 16)
1. Not really.... I knew most of it.... It’s mostly for children...brilliant.
2. I felt really as we came out, how wonderful the world is, then at the end, what man is actually doing to it...destroying it.
3. For me...yes. I would like more information...for most people, no.
4. Yes.
5. I felt the only part that didn’t quite work was the rainforest.... It was very dark and it could have been a bit bigger.... You seemed to pass through it too quickly...and maybe (with) humid atmosphere...maybe water dripping on people ha, ha, ha, I think there’s too much to say about environmental issues.

(73) Elderly British male (Ed: up to 18)
1. Especially with the animals...very interesting.
2. I think it’s to show people about the environment, the world and people, and machinery, but basically the environment.
3. Everything can be improved.
4. (unclear)...in Portsmouth they wanted to build a burner (incinerator) and thousands of us signed a petition and it was stopped.
5. I think it is very well laid out. I think the local governments could do a lot more.... I come from Portsmouth and there is a lot of floods...a
lot of problems for the local people.

(74) American (Caucasian-Italian) female in her twenties (Ed: 1st degree)
1. No.
2. ...we need to care about where we live.... It is very important.... Some day we don't care, we won't have any left.
3. No.
4. No...except I'm from the States and we do recycle.
5. It is very beautiful to look at...it looks real. I think that education is very important (because) people are not educated about what is going on and until you educate people they won't be able to help the situation.... Education is extremely important. A lot of people in the US are very aware and doing things about it.

(75) Middle-aged British male with a male friend (Ed: Higher degree)
1. How different people interact...if there're too many of one species, others deteriorate. The barn was interesting...the rats.
2. How everything interacts.
3. I think it is quite good....
4. No.
5. I have a science background so I know a lot of this anyway, but I'm not really environmentally conscious in a way.... I'm not politically aware ...I know it's there and I know it's important. I wouldn't like to pollute a river...if a river gave me home, I wouldn't pour rubbish into it. But I think the earth has plenty of ability to correct itself. I don't believe in the greenhouse effect.... I don't believe in the ozone thing.... I don't believe that exists. I believe the more carbon dioxide is produced by industry, the more green plants grow.... It will correct itself.... I saw an experiment in America and they had 3 different greenhouses and 3 different levels of carbon dioxide and the plants grew
in 3 different rates...the more carbon dioxide the quicker the growth, so I think the earth corrects itself. I think a lot of this, nowadays, is political.

(76) Middle-aged Canadian female with a girl (Ed:up to 18)
1. All interesting but mainly man's impacts.
2. That's, we must really do something individually.
3. I think it is very impressive.
4. My job is working for a resource company as a cook in Canada so we are always dealing with environmental issues but I have never been in a demonstration.
5. I still feel we are not really shown the true picture which I believe is political...

(77) Middle-aged Polish male in his late twenties (Ed:Higher degree)
1. The part of the earth and the sun and air, time, distance.
2. Shows us the impact of humans on the earth and how humans (have used) fuel energy in the world.
3. Of course...because I find it is good to put some new ideas and thoughts ...to know what the basic situation of the human in the world.
4. No.
5. This question is very important to me because they (people) think (that) it (saving the planet) should be done through governments or conservation groups, but I think we should do it ourselves. But there are few possibilities to do it and employers should make it.... We have little opportunity...employers have more possibility.

(78) British male in his late twenties (Ed:1st degree and studying environmental science)
1. The whole exhibition (is) very good but (especially) I thought the
ecosystems and the nutrient cycles (are) very good. I would like it to be extended but it has to appeal to all ages, then it has to be simple... there has to be a balance.

2. Made aware of local environment and global environment.... How one reaction can spark another reaction.... A growing awareness of how much damage it is doing as well.

3. I think it should be extended (for) people like myself...(to make them) aware of what's going on already...more detail and more information in a separate part of (the) exhibition will appeal to people....

4. Yes...(a) member of Greenpeace and anti-nuclear marching.... I am not an activist...(but) I just believe in it.

5. I am glad to see it here. I think it is important (that) people understand the importance of what is around them.... The rest (parts) of the Museum relate to animal kingdom, geological history, prehistoric history but (they) do not link them up.... Humans have the ability to think and create a comparative world...the real world and their own ideal of how the world should be, and it is important for people to understand just where they fit in. Yes...I think I would like to see more on environmental pollution and not just the damage caused (by) people, but also the whole environment and also to link anthropology...human beings have damaged their own roots. If you come to a country like England that has a lot of other different influences from countries...a big Chinese community...a big South African community...a big West African community...a great many people from a different part of the world with the different cultural backgrounds (and) it is easy to see how colonial countries like Britain have (been) damaged (by) those cultures.... It is important to see it as an ongoing thing, and whilst all cultures will die out to provide a dominant culture, it is important to maintain those cultural roots.... I think it is important to link ecology and anthropology.
1. Recycling of the rabbit's (life)...the way that animals are eliminated.
2. To take responsibility of the environment.
3. The part you show man's responsibility. You should make people stop and look more at it (rather) you tend to walk straight through it.
4. All our school is actively involved in recycling.
5. I think it is very complicated and very well done.... We've just come back from (the) Disney World and you are competing with that. We have some very significant problems because of the urbanization that has happened. Masses of people have moved out of the countryside to the city...and they don't have any concern for their environment.... All they are concerned with is to get enough bread in their stomachs to live through to the next day.... But they are the kind of people that if you could show them recycling with profit...by selling their rubbish or by recycling in order to make building materials and to grow vegetables and to make their environment in such a way, they are motivated through (the) profit. It could have an enormous impact on what is going to happen in the country. But it is a question of that they have to feel (easily) that they want to throw away...their cans...(on) the road, because it's (more) convenient (than) recycling the cans...at the moment. It is easier to dump it. (unclear). We've just come back from Disneyland.... They are creating an enormous amount of rubbish...everything is thrown away.... Can you imagine 14m tourists? Amount of rubbish. I don't know where it's going.... A superficial nicety but underneath, a real mess. It's not always convenient to recycle... They are hoping the Government will help.... Poaching is a big problem.... All the people are starving...going into the town to find work.... They are poaching for food and to sell.... Severe droughts and wars have wiped out the whole country...and they have to eat (only) what's left. The poachers who are selling the horns...rhinos...that is the big problem.... It is also a traditional way of
hunting...and farming methods are not good.... Israel has used the dry areas to make something out of it but our Government is not doing what they should in our country. South Africa is not badly off...the economy is sophisticated, but central Africa is not self sufficient.

(80) British female in her late teens with 2 female friends (Ed:up to 18), (She refused to be tape-recorded)
1. Rainforest.
2. Thinking about the environment.
3. No.
4. No.
5. I dislike stuffed animals. The Government has not enough power to conserve the environment.

(81) Korean male in his twenties with two Japanese females (in their twenties), (Ed:1st degree)
1. Leaf factory.
2. Human impacts on the environment.
3. It is good idea to stress on human impacts.
4. When I was a member of boy scout, I used to pick up rubbish in the mountain.
5. It should be extended. Our Government has not enough to care for our environment. In addition, about rainforest in Amazon, non-governmental organizations must co-operate each other and pressure governments into changing the policies of saving the rainforests.

(82) Middle-aged Australian female (Ed:up to 18)
1. Most of it (are) interesting.... My daughter, agricultural scientist told me to come and look, but it is far more comprehensive than I thought.
2. Information...particularly the section on the weather...people should relate their weather to what they have seen in this exhibition. Be careful...caution.

3. I think it is very good.

4. Yes...I am very interested and I try to be very careful in my own environment...we have lots of trees.... Apart from that, I am disgusted with growing pine forests...10 million pine trees are not a managed forest...it is just like growing grass...they need many species.... I used to live in the middle of the jungle...and Kuwait.... My husband was rebuilding the environment and infrastructure. They (his group) would spend millions of dollars...but not a few thousand (for) an air cleansing plant. I have a few personal conflicts with my husband’s working environment.

5. —

(83) Moroccan male in his twenties with his daughter (Ed:1st degree)

1. Yes, the world of fish...the colours and information.

2. Shows that life is not what you can see (that) it exits, and we have to preserve it....

3. This exhibition does not need to be improved but it needs to be put it (on) many different places.

4. No.

5. Price is too expensive...but charge will put people off...less charge more people. ...(about) the style of living in my country we do not have much industry but still we need more education. People will respect (it) more.

(84) Danish female in her early twenties (Ed:up to 18)

1. Yes, it was very interesting...the environment of the human being...how we influence others.
2. What we are doing to the world and how should pay for it.
3. Need small children to understand...more information for small children.
4. Yes, I am a member of the Worldwide Fund for Nature and I am working for an organisation that collects money for building schools in the third world countries.
5. I think it was very good. In Denmark it has a good environment (because) they have strict restrictions.

(85) Middle-aged British-Jersey female (Ed: up to 18)

1. ...I was looking at it through (which was) educating children.... I found it simple enough for them to understand...particularly the recycling and the use of the sun...energy comes from the sun...the cycle of animals and herbivora, and the carnivora eat the herbivores...a lot of emotion is put in to the recycling...and I thought it would help children to understand. I have a very define philosophy on life...life is recycled...including us.

2. How the world and nature is balanced and how necessary it is, not for our own greed but for our own future.

3. Depends on what you are aiming for. For children it is important...there are little elements that need to be clarified. There should be a manual for the teachers for them before they reach the exhibition. If there was some form of information, they would know what was coming, to ask the children prior to arrival. About the balance of energy, balance of animals...(if) the children were...not really looking...like looking at a book and looking only at the pictures and not reading the words, a manual would make a lot of difference.

4. Oh...yes we did...one of our valleys was to be flooded for a reservoir...a beautiful valley.... We fought for 7 years and ...won...(unclear). I am also a member of the ...museum. I am in the plant section.

5. In Jersey, (about) the environment on the whole, they are very
conscientious.... My best friend is...a person planting for the whole island and she knows everything about it. In there, we have one of the best sand dunes and the children are being educated about tourism .... We have elections and 4 or 5 green members got in to the Government ... which is very important.... They are keeping an eye on the environment.

(86) Middle-aged British female (Ed: up to 18)
1. Yes...I liked the rainforest and what we are doing to the planet.
2. To care of our planet...it (makes) my eyes (open).
3. I haven't been to other exhibitions but I think it is very good.
4. No.
5. I find the exhibition (is) very eye-opening...with the hands-on. It is good education for the children and (doesn't cost) too much money. I know more now than an hour ago.

(87) Middle-aged British male with his partner and a his male child (Ed: 1st degree)
1. I thought the two bits were good (the barn community and ....)
2. Just a general understanding of the world ecology.
3. No, it is designed at a certain level at secondary (school) upwards. It works fine.
4. Yes, with a sponsored cleaning (by) Hertford of Wildlife Trust. We cleared all the rubbish and plastic up one morning.
5. Not enough to catch the imagination for his age (his son)...only move on, only the bulldozer effect.... We all understand it but no one takes any notice.... We don't take it seriously.

(88) British female in her twenties (Ed: up to 18)
1. The leaf factory.
2. The way it is all linked up together and we all effect (on) everything else.
3. No, it's alright the way it is.
4. Yes...I belong to Green Peace and have done sponsored walks and belong to the World-Wildlife Fund for Nature and National Trust.
5. I am glad I had the time to look through. Enough is not done about it (the environmental issue) and I don't think the Government cares (for) all about it. They say what they have to say to get by, but they don't really mean it (saving the planet)

(89) Brazilian female in her teens (17 years old) with a female friend (the same age), (Ed: up to 18)
1. Yes...the earth.
2. Ecology.
3. No, I think it is alright.
4. No.
5. I liked it very much. We have to think more about we do not care.

(90) Elderly British male (Ed:up to 18)
1. I came to see the photographic exhibition, so the ecology exhibition is OK.
2. The whole of life interacts and humans have to take their proper place and don't upset nature.
3. Some of the exhibition need to grab your attention....
4. No.
5. I wouldn't have come if (there) hadn't been...the photographic exhibition. Sometimes it seems to me that the Government overrides the wishes of the people...that's probably the same everywhere.

(91) French female in her twenties with her male child (Ed:up to 18)
1. Yes, of course...the whirlpool...the beginning.
2. —
3. Always improve.
4. No.
5. Just...get people to come and have a look, and make them think. In France...we till have a lot of things to do (by) the Government.... People talk about it but (are) not very aware.

(92) Brazilian female in her twenties with her male child (Ed:Higher degree)
1. I saw (it) very quickly. I don't see much.
2. The conservation.
3. Not sure...I cannot say.
4. No.
5. In my country there is the problem of the rainforest....

(93) Middle-aged South African male in his late fifties (Ed:1st degree)
1. The impact of the whole thing...works together.
2. Each individual has to have a very good look at things and saves it from disaster.
3. There's always room for improvement but I think it is very good.
4. Not specifically but I am very much aware of environmental issues.
5. I think it is a very good display. South Africa is becoming more aware of environmental issues as the whole world, and a lot is being done there especially in education.

(94) Belgian female in her twenties with 2 children (Ed:Higher degree)
1. Well, it wasn't very new to me, but the earth and water was very effective, very beautiful.
2. To look after the earth.
3. No, it's good as it is.
4. Taken part in debates but nothing major.
5. It was very well done. It’s as bad as it is here (the UK)...nothing much is being done on environmental issues (in my country), which is a big problem.

(95) Middle-aged Japanese female with her male child (Ed:1st degree)
1. To start with the rainforest is a good idea because it suggests that we must live with the nature.
2. To be aware of our environment where we live in.
3. No.
4. In Kobe city where I live in, Japan, some recycling projects have done, and I joined.
5. One huge country disposed of nuclear waste in the sea of Japan. That is a big international problem. We must care not only for our local environment but for the whole environment as well.

(96) Middle-aged Argentina female (Ed:1st degree)
1. Yes, environment and conservation.
2. The conservation and how it is our responsibility.
3. No.
4. Yes, in my county Brazil Eco 1992...about the environment.
5. Many young people (are in) the disaster...oil in the sea in South Argentina...oil effect (in) the sea.

(97) Middle-aged British female (Ed:up to 16)
1. I thought the globe and water cycle...it was good but this was breathtaking...very clever the way it was done.... This had the most impact...this feeding, the cycle going all the way through.
2. ...We are damaging our universe. I don't know what the answer is.
3. The only thing that could give more impacts is the very last bit saying
what we’re doing...and how we’re destroying it, and there should be more impact (about) the forestry and sewage going back into the water.... (These) points should be made stronger...just add a little more to it. It paints a wonderful picture and then what we are doing to destroy it should be made clearer to these youngsters.

4. No, I do what I can, recycling stuff at home and in my office... environmentally. I do just what I can.

5. I think it is wonderful. It is world-wide and people should be made more aware. Perhaps you could publicize this exhibition to start with and get people...coming from all over. I reckon you should advertise it. I’ve got 3 children and grandchildren and I live in Bristol and I am going home to tell them (that) all should come to see this exhibition.

(Elderly British female in her sixties (Ed:1st degree)

1. I particularly enjoyed the very early parts with the mirrors. I thought they were very dramatic and arresting...I thought they were absolutely outstanding.

2. I hope there is a message for the younger generation that each one of them is involved and that each decision that each of them makes will effect the whole life of the planet. I hope that was the message that (I) come over. I’m sure that was the intention (of the exhibition).

3. I thought the message about...the need for the individual to do something comes too late. I think one had a lot of dramatic and good presentations but it all fades away at the end, and the human impacts (on) the environment has got rather lost and the message doesn’t come through.

4. Yes, lots. I’m a member of the Friends of the Earth. We have made many demonstrations about sewage in the sea and the green environment.

5. I’m delighted it there. It’s so much more thrilling than when I came to the Natural History Museum as a child. There is so many that it makes me
weep. I would like to see the government wake up about sustainability. I think they pay lip service to it and I think Britain is the dirty man of Europe, and we are doing very little. I am hopeful about the environmental future but I think stopping dumping in the sea may be one of the first actions we can do. But there are so many (to do, and ) it is almost impossible to mention.

(99) Elderly British female in her sixties (Ed:1st degree)
1. I found the whole thing (was) very interesting. I was surprised really. I loved the rainforest....
2. We are the only people that can make any difference. If we don't change it there will be nothing left. What we have is valuable and we should work very hard to ensure that we have still got it and our children's children (will) have still got the rainforest. It is valuable and we should keep it.
3. No, I think it is extremely good.
4. No.
5. I think it is the best thing I've seen so far. I thought the ecology would be very boring but it wasn't. It was very stimulating. We are rather bad about ecology but we are getting better. I think the young people are much more aware and as the years go on, things will get better.

(100) Elderly British male (Ed:up to 18)
1. I am interested in exhibitions and I'm over 60, so there's not much that (I) can surprise (like as)...you are over 60 and (hence) I go to exhibitions to see how the exhibition has been put together...how it has been designed. Ecology is not my subject...my subject is to do with exhibitions.
2. I imagine is to say there is only one earth and we should look after it.
3. I think better use could be made of the space... the Natural History Museum has only so much space. And in Paris, the Science City Space is designed entirely for children, lots of TV screens and things presented in a childish way (which) is more like an entertainment and I don’t think that is good myself. I did a mural myself in the Science Museum some years ago in the iron and steel section, and it was getting towards the point where it wasn’t academic (but) it was becoming something for schools and I found that (was) disappointing. I couldn’t really answer that question... if (museums) want the space to be used as a school resources...(in the exhibitions). I feel this is aiming low in terms of the educational aspect. If the Natural History Museum feels that it has to do that... and I am not going to quarrel with it.

4. No.

5. Too many cars. I’m afraid I have a car.... I live in the country and the buses are very few and the trains look as though they may be fewer, so you seem to have (only) one (or so in a day). You don’t have anyone to talk to (if) you get in your car, and listen to your cassettes or disembodied person on the radio. If you are in a train, you can at least talk to somebody, or on a bus you can talk to somebody, (because) we don’t have the responsibility of driving it.

I have now finished the interviews on Thursday 10 February 1994, 4.08 pm in the Ecology Exhibition in the NMM, London.
APPENDIX 18:

A NHM'S QUESTIONNAIRE FROM A LEAFLET ENTITLED "GUIDE"

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**WIN A BOTTLE OF CHAMPAGNE!**

**VISITOR QUESTIONNAIRE**

You could be a winner in our monthly Free Draw by answering these few questions and placing the completed section in the boxes by both exits.

Please ensure that only one person per party fills in questionnaire.

What prompted you to visit the Museum rather than somewhere else today?

- Press
- TV
- Radio
- Bus-sides
- Leaflet
- Child's request
- Personal recommendation
- Just happened to be passing
- Been before, wanted to show someone else
- Some other reason

How long have you spent here?

- 0-2 hours
- 2-3 hours
- 3-4 hours
- 4-5 hours
- 5-6 hours
- 6+ hours

**What did your party like best?**

**What did your party like least?**

**What did you think of our food facilities?**

- Good
- Average
- Disappointing
- Did not use

**What did you think of our shops?**

- Good
- Average
- Disappointing
- Did not use

**How do you think they can be improved?**

How many times have you visited this Museum in the last 12 months?

- Just this time
- Twice including this visit
- Three or more times

Do you have a season ticket?

---

Have you recently visited or do you plan to visit any of the following attractions?

- British Museum
- Buckingham Palace
- London Zoo
- Madame Tussauds
- Tower of London
- The Science Museum
- Other

Where did you travel from today and how? (e.g., from home by tube)

Have you any other comments about your visit?

---

How many adults (15yrs or over) and children (0-14yrs old) are in your personal travelling party?

- Adults
- Children

Please write numbers into the boxes below to indicate how many of those people in your party are:

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Please put a star (*) beside the category you fall into.

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Name

Address

Postcode

Date

Under the terms of the Data Protection Act, you have the right to advise us at any time if you do not wish to receive mailings from The Natural History Museum or organizations with whom we co-operate.
1. Match column (A) with (B) (You can get one point if all in correct)

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<thead>
<tr>
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<th>[B]</th>
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<tbody>
<tr>
<td>a) Atmosphere</td>
<td>1) is the solid rock of the Earth's outer layers.</td>
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<tr>
<td>b) Hydrosphere</td>
<td>2) is between a few kilometres over our heads and a few kilometres beneath our feet where all the diverse forms of life flourish.</td>
</tr>
<tr>
<td>c) Lithosphere</td>
<td>3) is the total reserves of water on the Earth.</td>
</tr>
<tr>
<td>d) Biosphere</td>
<td>4) is the mixture of gases which make up the air surrounding the Earth.</td>
</tr>
</tbody>
</table>

2. What does ecology mean? Choose one.

The study of the relationships between
1) animals and plants.
2) ultraviolet rays and skin cancer.
3) living organisms and their physical environment.
4) man and the environment.
3. Which is true? Choose one.
   1) Only green plants can directly convert the sun's energy into a usable form.
   2) Only animals can directly convert the sun's energy into a usable form.
   3) Both green plants and animals can directly convert the sun's energy into a usable form.
   4) All living things have an element which can directly convert the sun's energy into a usable form.

4. Find one sentence from the following which describes "chain", "web" and "pyramid" as a part of ecology.
   1) Different stages of looking at energy and raw materials moving through living communities.
   2) Different ways of looking at energy and raw materials moving through living communities.
   3) These words have the same meanings that is a way of looking at energy and raw materials moving through living communities.
   4) One of the methods of building an Egyptian pyramid. A "chain" was used to pull stones and a "web", which means net, was used to support a pile of stones.

Humans have been destroying our natural worlds for a long time. Examples include the greenhouse effect, ozone layer depletion, acid rain and deforestation. Our destiny is tied to nature's destiny. If we are to safeguard the future of life on the Earth, it is vital that we learn to apply our understanding of ecology. Thank you

Jack H. Iguchi (BA, MA)
Curator, PhD researcher, University of London
APPENDIX 20:

ECOLOGY STUDIES CERTIFICATE

THIS CERTIFICATE IS AWARDED TO

On completion of a "course" in

ECOLOGY

IN THE ECOLOGY GALLERY
THE NATURAL HISTORY MUSEUM, LONDON

which included the following subjects

1. Rainforest (diorama) experience
2. Earth science (atmosphere, hydrosphere, lithosphere, biosphere)
3. Ecosystem
4. Water cycle
5. Living things in the sea and on the land
6. Energy and sunlight
7. Photosynthesis (leaf factory)
8. Chain, web and pyramid
9. The barn community
10. Environmental changes and human impacts on ecosystems

Awarded
Jack H. Iguchi (BA, MA)
Curator, PhD researcher,
INSTITUTE OF EDUCATION, UNIVERSITY OF LONDON
Dear Head

Could you allow me to introduce myself? I am a PhD researcher at the Institute of Education, University of London and am researching into environmental education through museums.

I am conducting a detailed case study of the Ecology Exhibition in the Natural History Museum, London, in order to improve such exhibitions. My supervisor is Mr Ashley Kent, Senior Lecturer in Geographical Education at the Institute. Dr Roger Miles, the Head of the Department of Public Services in the Natural History Museum is fully supporting these investigations.

According to the Natural History Museum's visitor records, on 1993, your school children visited the Ecology Exhibition with I would very much like to know how effective this exhibition was for them. I enclose a questionnaire sheet. Could you ask your colleague to answer the questionnaire him/herself and also to give it to 4 children (preferably 2 girls and 2 boys) who went to the Ecology Exhibition, and return the completed sheets by 25 March 1994, if at all possible? Thank you, in anticipation of your help.

I look forward to hearing from you.

Yours faithfully

Jack Higuchi (BA, MA), Curator and PhD researcher
March 1994

Dear Colleague

I am supervising the PhD research of Jack Iguchi who is engaged in a detailed case study of the Ecology Exhibit in the Natural History Museum. As a part of that case study Jack wishes to question a selection of teachers and students who visited the exhibit within the last year or so. The questionnaire he has devised is quick and straightforward to complete and I am seeking your support on this matter, on Jack's behalf.

Jack is a most committed researcher. He is a trained teacher from Japan, and has recently completed a diploma and MA in museum education from the University of Leicester. His research focus concerns the important links between museums and environmental education.

I fully endorse his research and hope you and some of your staff and pupils might be able to complete the enclosed questionnaire which should be quick to complete.

Both Jack and I would be most grateful if you could organise this.

Thank you, in anticipation of your help.

Yours sincerely,

Ashley Kent
Senior Lecturer in Geography Education
Dear Principal

Thank you very much for arranging that your school children and your staff answered my ecology questionnaire and for returning the results to me. This data is most helpful for improving the ECOLOGY exhibition at the Natural History Museum, London as well as for throwing extra light on the issue of museums and environmental education.

Thanks again and all best wishes to you and your staff.

Yours sincerely

Jack H. Iguchi (BA, MA)
Curator
APPENDIX 24:

SCHOOL QUESTIONNAIRE ON THE ECOLOGY EXHIBITION IN THE NATURAL HISTORY MUSEUM, LONDON

DATE:

Please tick.
Teacher [ ], Pupil [ ]
Male [ ], Female [ ]

[1] Could you answer the following?

1. What do you remember about your visit to the Ecology Exhibition?

2. What did you learn from your visit?

3. In your opinion, does this exhibition need to be improved? Why? In what way?

4. Have you any other observations to make about the experience?
Could you tick the following?

1) To what extent, are you prepared to change your life style to help "Save the Earth"?

not at all                     a great deal
1                           2    3    4    5

2) Whose future responsibility is it to "Save the Earth"? Please tick only one.

a) Government
b) employers
c) conservation groups
d) individual persons

3) If there was a very attractive exhibition on ecology, describing "human impacts on the environment", would you go to see it?

definitely no                              definitely yes
                     1   2   3   4   5

Humans have been destroying our natural worlds for a long time. Examples include the greenhouse effect, ozone layer depletion, acid rain and deforestation. If we are to safeguard the future of life on the Earth, it is vital that we learn to apply our understanding of ecology.

Thank you

Jack.H.Iguchi (BA, MA)
Curator and PhD researcher, University of London
APPENDIX 25: EXAMPLES OF SCHOOL QUESTIONNAIRES FILLED APPENDIX 25-1

SCHOOL QUESTIONNAIRE ON THE ECOLOGY EXHIBITION
IN THE NATURAL HISTORY MUSEUM, LONDON

[1] Could you answer the following?

1. What do you remember about your visit to the Ecology Exhibition?
   Very impressive. Recreation of rainforest very good and the audio-visual entrance hall (sun etc.) was spectacular and informative, as was water cycle. Exhibit on carbon cycle good also.

2. What did you learn from your visit?
   The major theme we concentrated on was that all events, actions, reactions in the ecosystem relate to and affect each other in a pair of mutual interdependence. The exhibition graphically helps illustrate this.

3. In your opinion, does this exhibition need to be improved? Why? In what way?
   There wheelchair access to upper half?

At the time no teacher's fee sources were available for work before the visit although I visited the exhibition alone to assess access and concentration. Ready

4. Have you any other observations to make about the experience? Mode activity
   sheets would be helpful.

The group I attended the exhibition with was one of adults with a learning difficulty. It seems from your information and covering letter that you are not aware of this, is this a fault of the museum's record keeping? Not only children are interested involved in education!
SCHOOL QUESTIONNAIRE ON THE ECOLOGY EXHIBITION
IN THE NATURAL HISTORY MUSEUM, LONDON

DATE: TF-2

Please tick.
Teacher [ ], Pupil [ ]
Male [ ], Female [ ]

[ ] Could you answer the following? I don't know - that's for you to judge!

1. What do you remember about your visit to the Ecology Exhibition?
   Entry to a rainforest, dinosaurs, walk up to an area with buttons? where I lost my students, up again to the many screens, then to the sun as an energy source and the huge plant leaf where I felt as though I was inside a leaf. There's different habitats and the death of a rabbit and the recycling. I think the "end" was past some large pictures or something. They're about our influence.

2. What did you learn from your visit?
   The leaf is a valuable learning tool!
   The students ran up the ramp - very hard to control.
   That it's fun for them to take shots into instead of going thru the exhibition as expected.

3. In your opinion, does this exhibition need to be improved? Why? In what way?
   More interaction with the exhibits needed to keep students' attention.
   There were areas which most students stood and watched (the screens) and ones where they were involved - the landing area past way up the ramp (with a screen?); and they liked the buttons - sun as an energy source. However, they noted the dioramas at the start and the habitats etc at the end, even with worksheets designed to emphasize photosynthesis and energy use, as well as...

4. Have you any other observations to make about the experience or responsibility?
   The "workers" were very negative towards some of the students and if they had approached them or myself more positively, the students could have been directed towards the more accessible and interactive exhibits.
SCHOOL QUESTIONNAIRE ON THE ECOLOGY EXHIBITION
IN THE NATURAL HISTORY MUSEUM, LONDON

DATE:

Please tick.

Teacher [ ], Pupil [ ]
Male [ ], Female [ ]

[1] Could you answer the following?

1. What do you remember about your visit to the Ecology Exhibition?
   I remember that at the beginning of the exhibition there was a huge screen. Everything was very interesting, and it was shown to us in an interesting way as well.

2. What did you learn from your visit?
   Basically, it helped to understand ecology much better. Everything was clarified.

3. In your opinion, does this exhibition need to be improved? Why? In what way?
   Maybe it could be improved in some way to make it more exciting for younger children. Maybe add a couple of computer games for children.

4. Have you any other observations to make about the experience?
   It was well organized. What I found helpful is that it was all on a straight line so you couldn't get lost or go to a different room. The information screens are also very interesting but I think they might be a little complicated. So they should simplify it a little for younger children to understand.
[1] Could you answer the following?

1. What do you remember about your visit to the Ecology Exhibition?
   - The large screen showing waterfalls etc.
   - The inside of a plant's leaf.
   - The scale showing things that killed off and things that helped a population of rats to survive.

2. What did you learn from your visit?
   I learnt also more about food chains, and that the removal of one species could have an effect on the whole chain.
   I learnt much more about the effect man has on the environment and became more aware of how we are destroying it.

3. In your opinion, does this exhibition need to be improved? Why? In what way? At the end of the exhibition, I think it is the poor exhibit, is a video on 'man's impact on the environment', it is very good, but felt not everyone would stop to watch the whole show. There should be greater emphasis at the end on the effect man has had - the conclusion to the exhibition should be more emphasized.

4. Have you any other observations to make about the experience?
   - Very well presented.
   - Good the way you pushed up stairs across bridge, meant you were never bored of environment.
   - Good the way many exhibits presented completely differently.
APPENDIX 26:

ANSWERS TO THE SCHOOL QUESTIONNAIRE

On March 1994, school questionnaires were sent by J.H. Iguchi, this researcher, to the schools which visited the Ecology Exhibition in the NHM, London, during 1992/3, and following questions were asked:

1. What do you remember about your visit to the Ecology Exhibition?
2. What did you learn from your visit?
3. In your opinion, does this exhibition need to be improved? Why?
   In what way?
4. Have you any other observations to make about the experience?

Number of respondents:
Teachers - Male (TM): 16
Teachers - Female (TF): 23
Pupils - Male (PM): 33
Pupils - Female (PF): 76
TOTAL: 148

NOTE: Other questions (using methods of category and semantic differential scale) are showed in the questionnaire sheets inserted in Appendix 24. In addition, following answers were directly transcribed from original questionnaires filled by respondents. Hence these might include grammatically incorrect sentences and spoken language.

1. TEACHERS - MALE (TM)
1. I have visited this exhibition more than once. The last visit was in early '93. I took an A level group, and felt that the exhibition was a good introduction to ecological topics. I did feel that some parts of the exhibition were using very expensive and high tech ways of presenting ideas that could perhaps have been done in other ways.

2. I personally did not learn much new material (or if I did I have forgotten it by now!) but I would expect students - especially at KS3/KS4 level, to learn a great deal.

3. On the whole it is a very good exhibition, very eye-catching and well presented. In relation to my slight criticism in point "1" above, I feel that there is room for more small scale displays - perhaps aimed at more advanced students - using more real organisms. These could be out of the "main traffic" of the exhibition, to allow the opportunity to browse and reflect.

4. I expect that our sixth form (year 12) students gained from the experience - and the issues raised are very important. I think that year 10/11 students, and possibly KS3 too, would gain a great deal.

---

1. Very impressive. Re-creation of rainforest very good and the audio-visual entrance hall (sun etc.) was spectacular and informative, as was water cycle. Exhibition on carbon cycle good also.

2. The major theme we concentrated on was that all events, actions, reactions in the ecosystem relate to and effect each other in a system of mutual interdependence. The exhibition graphically helps illustrate this.

3. Is there wheelchair access to upper half? At the time no teacher's sources were available for work before the visit although I visited the exhibition alone to assess areas to concentrate on. Ready made activity sheets would help out.
4. The group I attended the exhibition with was one of adults with a learning difficulty. It seems from your information and covering letter that you are not aware of this. Is this a fault of the museum's record keeping? Not only children are interested and involved in education!

TM-3

1. Having been to the exhibition 3 times over the last 3 years, I can remember most of the exhibits. The multi-monitor display on the water cycle is the most impressive/memorable single component, but the whole exhibition makes a strong impression.

2. As a teacher, I don't think I learnt anything completely new, though I found the displays gave a vivid illustration of what I already understood in an academic way.

3. It is very dependent on technology, and each time I have been, at least one of the exhibits has been out of action - this is a problem!

4. Pupils have found the first display (the video film crew/film title tableau) rather quirky - they don't immediately grasp the significance of the "Whole Picture" idea - this would be better at the end in a way.

TM-4

1. An extremely helpful exhibition for students working on GCSE course work on the destruction of the rainforest. Vivid images - wall videos on water; bulldozer; Indian chief. Touch computer on climate was very effective. The life cycle of the rabbit impressed my four years old son....

2. Reinforced my belief that properly constructed museum displays are a significant learning aid to students.

3. Better support materials for pupils to use. We devised our own, but worksheets from the museum might have helped. More "hands-on" activities? One improvement already made by the time of my last visit compared with previous 3 was the sound track to the video wall replacing handsets.
4. One wonders at the appropriateness of some sponsors.

TM-5

1. Very spectacular.
2. Very little.
3. The exhibition teaches little about the principles of ecology. How this point of view the original ecology exhibition was far superior. It used worksheets, and as a tool for teaching.
4. Ecology was excellent. People will no doubt be impressed by the technology involved in presentation of the exhibition which no doubt ties in with the current philosophy of the management of the museum. Both my colleague and myself regard the new exhibition as a retrograde step and hope that the same fate does not befall the "Origin of the Species" exhibition.

TM-6

1. The entrance reconstructing a tropical rainforest; the inside "stem" of the leaf; energy flow through the food chain - display; geophysigical cycles displayed on television screens and interactive following.
2. Much of my knowledge was reinforced by the visit but yes, I did learn from my trip to the exhibition.
3. The students I took to the exhibition enjoyed the interactive parts. I thought some improvements in bringing educational "amusements" would maintain their attention longer. Some students passed by some of the exhibits too quickly. It needed to stimulate other senses eg. smell, touch.
4. No.

TM-7

1. Water, earth, plant growth etc., video exhibit.
2. Children learn quickly, enthusiastically from this type of well organized displays.
3. Yes, further step by step exhibits of different parts of plant body - eg. root, stem, leaf, buds, flower, fruit and seed.

4. Rather disappointed that the old plastic models of leaf, chlorophyll etc. were removed. They were excellent models to explain leaf structure so clearly. The should be back. Internal structure of root stem should be there. Flower, flower to fruit, seed, germination plastic exhibits should be included.

TM-8
1. As impressive "walk-round" display, massive TV screens (not sure how useful this was) and short quotations lining the walls.

2. The quotations (probably the cheapest element !) were most interesting; the rest was good but I don’t recall learning anything I didn’t already know.

3. I can’t remember it vividly enough to say. The students I took were 18 year olds who have since gone on to universities (hence I don’t have questionnaires completed by them).

4. No.

TM-9
1. ...the atmosphere...inside the exhibition, the sounds and special effects.

2. How different ecosystem supported life.

3. The disabled lift was not working and apparently hadn’t been for sometime. More interactive experiences may be. "Characters" could be wandering around - talking to visitors, explaining who they are. - Yes, install a virtual reality environmental-ecological experience; expand the exhibition area - and build moving parts; - falling trees (like the bulldozer) etc.

4. -

TM-10
1. Diversity of habitats.
2. Delicate balance of nature.
3. More interactive and to show how delicate environmental balances are. Otherwise individuals will not understand just how little it takes to irrevocably alter the gene pool.
4. It is a very slick experience, but to my mind, lacked substance and in many places were superficial. Perhaps an advanced and beginners section would be better.

TM-11
1. Enjoyed the quotes in the entrance hall. TV's...and very impressive. Pip water melon representing of earth and sun useful. Good balance will use it again.
2. Not a lot, I didn't already know.
3. Yes, needs "A" level worksheets to make it more beneficial rather than look see and forget.
4. No.

TM-12
1. Very glitzy, expensive looking, inspiring, but very little detail. All surface polish but little substance.
2. -
3. Yes, the activity seemed to certain little organic material. Plenty of models and push-buttons, this does not mean pupils pay attention to the exhibits.
4. -

TM-13
1. Scale and complexity; attention to detail; the only area I returned to later.
2. The information was well presented but I cannot recall any facts associated.
3. More living specimens; temperature and humidity need to match habitat.
4. Generally excellent.

TM-14
1. Impressive - especially use of visual effects like the mirrored pictures, globe etc. Also the touch screens.
2. Personally - little, but that was not the fault of the exhibition. It was informative, visually attractive and eye-catching.
3. No.
4. -

TM-15
1. A rainforest - sounds of life; a large globe; water cycle; food web; spectrum (It was a long time ago that I visited)
2. The link between living and non-living things.
3. -
4. We all enjoyed the exhibition.

TM-16
1. The majority of the exhibit.
2. Consolidated what I already knew.
4. More tactile for visual handicapped.

2. TEACHERS - FEMALE (TF)

TF-1
1. It was, I believe, my 3rd visit to this relatively new exhibition, so it is hard to be sure what I remember from this visit as opposed to previous ones. If what this question is getting at is what had enough impact to remember
about it then the small opening section with its rainforest ambience of light/sounds/vegetation was memorable. Other "memorable" sections are perhaps the great hydrological cycle mirrored display and the leaf/photosynthesis factory.

2. As a teacher, it's not so much what I learned as what I saw illustrated that interested me. What I know made most impression on me at the first visit was that for the senior student of ecology (e.g. my own adult access class or "A" level students studying environmental science) there was not really enough labelling or written explanation to set each display section into the context of the subject.

3. My initial disappointment at the new Ecology Exhibition was undoubtedly because, although much grander and more visually spectacular, it did not seem to make its purpose nearly as clear as the "old" exhibition and for my students (who I know are probably not the average visitor) it was not so easy to work one's way systematically through the different concept illustrated. I was disappointed that so much and the early part was boxed in by glass and one had to make a considerable effort to peer through small slits to observe the globes - representing the realms of the environment etc. The labelling at this point was also subtle in the extreme - not to say barely visible! Suddenly food chains were introduced (in the topical savanna...), but we were not told that these were really food chains - and we had not been introduced to the idea of energy from the sun, energy transformations and energy flow through ecosystems (as we were at the beginning of the "old" exhibition). I felt this to be a fundamental omission. Subsequently the marine habitats and biomes/trophic levels across continents were illustrated in quite interesting ways for non-specialists, school children etc. - but for higher level studies it would have been useful to additionally have these displays labelled using the appropriate ecological terminology i.e. referring to habitats, e.g. ecological niches, positions in trophic levels etc. so that such students could understand clearly which part of the structural framework of their
subject these displays were illustrating. It was all very "interesting" - but sometimes so much so that my students came away from it fascinated by some aspect that they had seen (which is not, of course, a bad thing in itself) but when asked later where it related to their theoretical studies they hadn't made the connection at all. Whilst on recognizes that this exhibition must cater for all age groups and levels of study. I did feel that the labelling, in particular, could have been much more specific and useful for more able students who already have quite a lot of knowledge. After all, everyone knows that the majority of exhibition users won't bother to read much - but some of us would - and would welcome a more clear sense of development and indication of how A leads to B in connected to C & D etc. Of course, some good teachers notes and student questionnaires for this exhibition would also be welcome. I deeply miss the 6th form study guide with its exercises from the "old" exhibition. Perhaps by next year I'll have written my own - I keep meaning to....

4.

TF-2

1. Entry to a rainforest, diagrams, walk up an area with buttons? where I lost my students, up again to the many screens, then to the sun as an energy source and the huge plant leaf where I felt as though I was inside a leaf. These to different habitats and then the death of a rabbit and the recycling. I think the "end" was past some large pictures or something many be about our influence.

2. The leaf is a valuable learning tool! That students run up the ramp and are hard to control. That it is fun for them to take short cuts instead of going thro' the exhibition as expected.

3. More interaction with the exhibits to keep students' attention. These were areas which most students stood and watched (the screens) and ones where they were involved - the landing area part way up the ramp (with a screen?), and
they liked the buttons - sun as an energy source. However they rushed the
dioramas at the start and the habitats etc. at the end, even with worksheets
designed to emphasize photosynthesis and energy use, as well as our
responsibilities.
4. The "warders" were very negative towards some of the students and if they had
approached them or myself more positively, the students could have been
directed towards the more accessible and interactive exhibits.

TF-3
1. Predominantly the more visual and/or "hands-on" sections of the exhibition
eg. rainforest section and bird noise, section on water cycle (with video
wall), the one on range of geographical environments (touching computer
screen) and the section on the life cycle on the rabbit.
2. Mostly about the huge diversity of our world. Also about the fragility of it
and how susceptible it is to human destructiveness.
3 & 4. Subtitles for visual displays which only have sound - I took a group of
deaf students to the exhibition - more back-up for the exhibition eg.
preparation materials prior to visit and an interactive pack suited to
different abilities/ages to be used whilst visiting the exhibition. This
could be made fun for younger children eg. quiz/questionnaire/game and
include a section for follow-up work to be done when back at school/college.
The exhibition ended quite abruptly - there did not seem to be any detailed
suggestions about what could be done to help preserve this earth - follow-up
work by students could include projects do help do this but the exhibition
could help and suggestions.

TF-4
1. It was a very informative exhibition using a clever combination of technology
and visuals to produce an interesting and exciting study into ecology. Very
clever use of factual information and audio visual display - I was
fascinated, as were the students, with the whole exhibition.

2. A considerable amount about the needs and diversity of the environment. The balance of nature and how its delicacy can so easily be upset due to the constant abuse and rape of these precious "flora and fauna".

3. No - I had gone to see the exhibition myself and was so impressed that, when the opportunity arose, I took the students along to see the exhibition - they were also highly impressed.

4. I was very pleased to see such a wide range of materials in the shop and also that it did not fall into the trap, as so many other galleries have, of extortionate prices. It was just within reach of the average student budget and as you probably know, students do like to have momento! Staff at the museum were also very helpful and friendly, and even patient with the students.

TF-5

1. Varied/colourful/attractive to the eye; interesting; great deal of pupil participation/accessible.

2. The aim of the visit was to focus on earth science section. The ecology section was included in the visit for pupils to wander through and digest at leisure. In answer to the question - depended upon pupil interest.

3. Exhibitions are great, it can get crowded. I wish it could be stressed to other group party leaders that their groups should be divided into groups and each group given time to visit the exhibition rather than all pupils visiting at the same time.

4. -

TF-6

1. I used to visit that exhibition every year and I have my own worksheet. So I remember nearly everything, but if I would distinguish one thing, definitely it would be the big sphere with the "water cycle" images.
2. The presentation of the exhibition, particularly the elevated bridges between halls.

3. Probably yes, I would prefer more information about different ecosystems and food webs. I believe a better worksheet will be necessary for students visits.

4. The images reflected in the "water cycle" sphere are wonderful and also the aesthetic sense of the whole exhibition.

TF-7
1. Different ecosystems - food chains and webs - the cycles - made of leaf and photosynthesis.

2. Probably not much more than I already knew - but the way it was organized was good and a learning experience.

3. Worksheets and some "take away" information to follow up later.

4. It was well spaced out - and varied and enough to keep the girls' interest. I like the old exhibition too. They really read a worksheet...this makes them read the exhibits thoroughly.

TF-8
1. Rainforest at beginning; walls in leaf; water cycle exhibit - but the pupils didn’t really understand it.

2. - not much

3. Feel it is rather gutless - lots of unused space and not much interactive material. Lots of things that are very walk-passable.

4. The pupils were not really excited by the visit - even though they were Year 13 and had a good background in ecology - not enough to capture them and get them interested - too gimmick they said.

TF-9
1. One of the most memorable sections was the introductory bank of screens with
images passing across them.
2. I work in this field and so actually I didn't learn anything new.
3. I think this exhibition is excellent - the only improvement I would like to see is on some of the interactive displays - some of these were broken on our visit.
4. I've been round this exhibition several times and always enjoy it despite my background in ecology.

TF-10
1. I remember my visit very well - we had just finished viewing the Ecology Exhibition when a bomb scare took place the whole museum was evacuated. This exhibition is very useful for students to see.
2. The visit reinforces the students understanding of the basic principles of ecology.
3. In these modern times students need more interactive exhibits with computer screens etc.
4. Valuable but could be improved.

TF-11
1. I'd been several times before so it is difficult to say what I remember about this specific visit.
2. I learnt that the kangaroo occupies a similar niche to the wildbeest.
3. No, I think it's excellent.
4. It's visually very exciting, the sound effects complement this and it can be experienced at several different levels - depending how thoroughly you do it.

TF-12
1. Rainforest - luxuriant plant growth - lighting effects - sounds of life; representation of the water cycle; marine environments; sun - dependence of life on light-energy - leaf factory; food webs. Human impact on the
2. Nothing new but gained a lot from the imaginative method of presentation.
3. -
4. -

TF-13
1. Noise, vast globe made of TV's. Views looking thro' glass on 1st at ground level as you enter exhibition. Various exhibits at first floor level.
2. Nothing, I didn't know already.
3. No.
4. The ecology exhibition was one of the more enjoyable on the day.

TF-14
1. Yes, generally, but I have no specific memories as this was fifteen months ago.
2. As above.
3. As above.
4. I went with a group of about 8 nursery nurse students whose ages ranged from 17-40! These students are out on placement and unable to complete the questionnaire.

TF-15
1. Good quality exhibition with lots of hands-on exhibits - good fun.
2. A good wide ranging exhibition - aimed at younger students.
3. Was very busy the day we visited - some exhibition areas difficult to get to!
4. My students really enjoyed the exhibition.

TF-16
1. Exceedingly interesting and informative in a structured, attractive and
attention-holding way. Brilliantly presented.

2. A great deal but time constraint restricted ability to absorb and retain much of what was exhibited.

3. -

4. Resolve to visit the museum again.

TF-17
1. The interesting layout of the exhibition; the appeal to all main senses; the range of knowledge to be found - the useful path around the centre.
2. Knowledge about the earth and environment.
3. No.
4. An enjoyable experience which the students enjoyed.

TF-18
1. The structure of the leaf; the large display on water.
2. -
3. No.
4. It would be helpful if there were questionnaires available for students of different age groups eg. primary/secondary/post 16 to concentrate their minds.

TF-19
1. Good explicit displays; impressive lighting and sound effects.
2. Detailed facts about ecosystems.
3. Much information was given by telephones - there weren't enough of these. Some exhibits were visible through small holes - there was crowding.
4. -

TF-20
1. It was an interesting exhibition.
2. Very little because we walked through it very quickly due to lack of time.
3. I need more time to study the exhibition to comment.
4. No.

TF-21
1. The TV sphere; touch screens/question/answers; the leaf model; the decay of
   the rabbit; the scales.
2. Some facts and figures.
3. Need to involve the spectator/observer more.
4. -

TF-22
1. Particularly the camera display in the centre room - stunning visual effects.
   Good walk through tropical rainforest.
2. Mostly known already.
3. No.
4. Excellent - the exhibition is thoroughly enjoyable.

TF-23
1. Introduction - planet earth; photosynthesis; food chains and webs; recycling;
   pollution.
2. -
3. There were not any worksheet at the time.
4. -

3. PUPILS - MALE (PM)

PM-1
1. I remember that at the beginning of the exhibition there was a huge screen,
   everything was very interesting and it was shown to us in an interesting way
2. Basically it helped to understand ecology much better. Everything was clarified.

3. Maybe it could be improved in some way to make it more exciting for younger children. Maybe add a couple of computer games for children.

4. It was well organized. What I found helpful is that it was all on a straight line so you couldn't get lost or go to a different room. The information screen are also very interesting but I think they might be a touch complicated, so they should simplify it a little for younger children to understand.

PM-2
1. I think the big screen at the beginning was very impressive but then everything started to get boring.

2. That humans should not experiment with nature - and that the world needs helps.

3. Yes, it should be done on a way that every age could see it without getting bored.

4. It was well planned, you had to go in order one thing after another without missing anything or getting lost.

PM-3
1. I saw a different part of the environment and that the display lot of descriptive things of the environment.

2. That everything in the earth forms parts of it and that if we do something harmful to one of those...we are all going to suffer even the environment....

3. I like the way it is presented and I found the information really helpful.

PM-4
1. Quite a bit – a lot of the specific information, but most of all a real feeling of the total interconnection of everything.
2. Many things relating to the cycles of life and ecosystems.
3. Overall quite good, not many static exhibits; could use something with a bit more action.
4. The video walls about the lithosphere, atmosphere and hydrosphere were great, particularly the one on the sun, I stared at it for 10 minutes.

PM-5
1. Was the touch screens.
2. Not very much.
3. Yes, the exhibition does need improving because it is not spiced up enough.
4. Need more money spent on it - showing more ways in which we can improve the environment. ...(unclear).

PM-6
1. I can remember the big TV display which was surrounded by the mirrors and I thought that it was very impressive and informative.
2. I did not learn anything that I can remember because the trip was so long ago.
3. I feel that the exhibition is very good but like most of the museum there was far too much information to take in.
4. No.

PM-7
1. The block of screens that had something to do with weather; ...walk; environmental walk; environmental view (TV screens).
2. Not much as it wasn’t the aim of the visit.
3. No.
4. Amaze that is based on environmental issues - you make decisions etc. -
similar to sinsity 2000 - you choose the right actions and you get to the centre.

PM-8
1. Diversity of habitats. Other than that very little. The exhibit was bland and uninteresting.
2. Delicate balance of nature.
3. More interaction. The exhibition was not appealing. Should be improved to be more like human physiology part of the Natural History Museum which is very interesting.
4. This exhibition did not appeal to me. It was static and to be frank, boring.

PM-9
1. The inside of the leaf; the inside of the womb; keeping the computer body alive; the television wall.
2. Various hormone facts; that it is very difficult to keep...90kg body alive whilst running...different ecosystems.
3. Slightly less walking and standing around.
4. Slight confusion as to where the ecology section ended other sections started.

PM-10
1. The interesting high tech displays made learning fun; the exhibit enlightened on to the elements, biomes and lives that make up our planet earth - and how these interrelate.
2. As above.
3. High tech display are good, fun and encourage learning. Put as many as you can, of the most sophisticated variety - if you can afford it!
4. -

PM-11
1. The things I remember is the wall with the windows in looking at the animals; the dinosaur display and the TV with the mirrors.

2. The information about the planet earth.

3. The display could be enlarged so that more information could be put in, with more displays.

4. Well built and looked impressive.

PM-12

1. The dinosaurs, their differences and similarities to animals now in the present; the environment they lived in... (unclear).

2. (unclear)

3. Yes, it is too plain.

4. No.

PM-13

1. I can remember the colourful and interesting attraction. I can also remember the ...setting.

2. I learnt some plant biology and a lot of evolutionary theory.

3. No, I think the exhibition is fine.

4. Not really, other than that I had a wonderful day.

PM-14

1. I remember the surroundings and various other aspects such as the importance of our tropical forests.

2. I learnt many things from the visit. The exhibition made me realize the crucial importance of our green land and animals that are suffering everyday.

3. No.

4. -

PM-15
1. -
2. I learnt a lot about food chain, the period of dinosaurs....
3. Yes, I think it needs a little bit of improvement, for example increasing more fossils which can move that can more attract people.
4. No, I have not.

PM-16
1. Absence of how important plants are to us, how they make food, what is fruit, what is seed!
2. We ignore plants all the time.
3. Yes, yes, yes, include everything about plants.

PM-17
1. I don't remember much but I do remember some of the display cabinets and the large video-wall.
2. I learnt a lot about ecology and how ecosystems work.
3. I think that the exhibition was very informative.
4. -

PM-18
1. The leaf factory; population balance; keeping the "computer-human" alive.
2. Climates and names of areas eg. tundra.
3. A few more practical things to do.
4. Well set out - easy to follow - good explanations and plenty to see.

PM-19
1. Man made pollution - large bulldozer and garbage.
2. Little that I did not already know, but displayed better, by more visual means.
3. More accessible to "A" level students - more detail. The display was GCSE or below.

4. -

PM-20
1. The hydrological cycle.
2. The visit enhanced work in the classroom.
3. It could change displays regularly - with the use of imagination, everything is possible.
4. All topics were touched on and explained.

PM-21
1. How different ecosystems inter-react and are linked (atmosphere, biosphere, hydrosphere, lithosphere).
2. Interrelationship between different ecosystems.
3. Audiovisual gadgets very futuristic; more emphasis on context.
4. Enjoyable and educational.

PM-22
1. Not a lot, a bit about wildlife.
2. Not a lot because I cannot remember.
3. Yes, it needs to be more interesting which will make people pay attention.
4. No.

PM-23
1. The huge "ball" of televisions.
2. Learnt about general ecological pollution.
3. If it is for students, should be more specific and more detailed (rise above GCSE level).
4. No.
PM-24
1. -
2. The aspects of the world now, and million of years ago.
4. -

PM-25
1. Artificial green forest.
2. Plants are very important.
3. Yes, how we spoil it.
4. It should be well publicized.

PM-26
1. The dinosaurs.
2. About interactions between organisms and their environment.
3. It's okay as it is.
4. No.

PM-27
1. Yes.
2. Not a lot.
3. Yes, nothing to make you stop at certain exhibits to be able to do things yourself.
4. No.

PM-28
1. I have a bad memory.
2. I cannot remember.
3. No, because it is great.
4. No.

PM-29
1. The sphere of TVs; the touch TVs; the animals.
2. Cannot remember.
3. No.
4. No.

PM-30
1. The screen showing natural things.
2. I learnt about the environment.
3. No.
4. No.

PM-31
1. -
2. Respect for nature for us.
3. No, is fine.
4. -

PM-32
1. Various ecosystems.
2. How things are interrelated.
3. No.
4. No.

PM-33
1. The rainforest.
2. A lot.
3. No.
4. No.

4. PUPILS - FEMALE (PF)

PF-1
1. The large screens showing waterfalls etc.; the inside of a plant's leaf; the scales showing things that killed off and things that helped a population of rats to survive.
2. I learnt a lot more about food chains, and that the removal of one species could have an effect on the whole chain. I learnt much more about the effect man has on the environment and became more aware of how we are destroying it.
3. At the end of the exhibition, I think it is the last exhibit is a video on man's impact on the environment. It is very good but I felt not everyone would stop to watch the whole show - there should be greater emphasis at the end on the effect man has - conclusion to the exhibition should be more emphasized.
4. Very well presented; good the way you kept moving upstairs across bridges, meant you were never bored of environment; good the way many exhibits presented completely differently.

PF-2
1. I remember about the different ways in which the cycling of water in the world's atmosphere was explained (by television on the large globe display) and various displays of food chains in different area of the world. I also remember the excellent display of the leaf with different colours representing pathway of molecules in the leaf,
2. I can't remember specific details I learnt from the visit, but having had a basic knowledge of ecology at the time, I felt that the whole exhibition enhanced my understanding of ecology and helped me to gather my thoughts and put them into perspective.
3. I feel that the exhibition was excellent and didn’t need to be improved because it was very informative!

4. I visited the section of creepy crawlies and the geology exhibitions and thought they were equally as good. Excellent for young children, people of my age and older!

PF-3

1. I remember the display of the earth surrounded by mirrors to give a greater effect. I remember seeing the displays of the carbon cycle and the food chains. I remember walking across bridges and I remember that there were lots of buttons to press!

2. I learnt about the factors which contribute to the destruction of our earth and also measures which are taken to prevent these. I also learnt about marine life in the ocean environments display.

3. In my opinion there was a great deal to read. I find that people in general prefer picture displays and things which don’t require a great deal of concentration. Think that bright interesting displays with a few facts are much more valuable than a page of facts. It is also easier to remember in this form.

4. No.

PF-4

1. I remember the dinosaurs and the fossils of dinosaurs. The model of the rainforest and short films.

2. We were only there for a very short time but it made me realize what we should be doing to help save other animals from extinction and to help save the earth.

3. I found it very interesting and I saw a lot of younger children enjoying themselves there. It looked as though they found it interesting. I don’t think it needs improvement.
4. There is just one thing, I think that you should give out leaflets on the exhibition so when people are walking around and looking at things if they had any questions about something they could look in the leaflet and that should answer that person's questions.

PF-5

1. I remember entering the exhibition to find firstly a rainforest exhibition where different animals can be heard. I also remember the different visual displays - some were made of television screens - one showing the earth, others water. There were many displays with buttons to press, and some with phones so you could listen to animals calls. I also remember the leaf factory.

2. I learnt about human effects on the environment - more about the greenhouse effect and the depleting ozone layer - how everything is dependent on each other for life.

3. I think that perhaps there was a little too much to read. I found the visual displays much more effective. In general people don't spare the time to read such long accounts.

4. No.

PF-6

1. The images were very impressive. They had a good impact on me so I remembered the information they were telling me. For example when we first came into the exhibition you looked through the glass at a large globe and each one looked like the earth and it told you about water, rock etc.

2. Learnt lots - carbon cycle; water cycle; nitrogen cycle; fluctuating populations, which plants, animals are useful to man for medicine etc.; about different environments; weather, wildlife and vegetation.

3. I think it would be very difficult to improve it.

4. I really enjoyed it and think it has improved loads from when I last went!
PF-7
1. I remember the big screen about the water cycle, and also remember the life cycle of a rabbit and the large scales about the balance of life.
2. That the ecology is something important, something that everyone should not ignore and take more notice of.
3. I do think the exhibition has to be improved because it was quite boring. I think they should make some more interesting features, so learning can be made fun.
4. It was well organized. You could never turn back and you got to see everything and you had no excuse to say you missed anything because it was all in order.

PF-8
1. Good displays, sound and visual effects. Remember the huge screen with mirrors everywhere (I think it was in the centre of the exhibition), rainforest simulation at beginning and varied forms of display.
2. Mostly revision.
3. It is a little bit limited if you actually know quite a lot of ecology already - the displays are good but I can't remember thinking "oh", I didn't know that! More specialized information might have been good but I do realize that most people go in with hardly any knowledge of the subject and it is important to grasp their attention first.
4. Visual and sound effects good.

PF-9
1. The big screen about the water cycle; the large balance about the balance of life; the life cycle of a rabbit; the big model about photosynthesis in a plant; the food chain.
2. That man has to change its ways before it ruins a lot of the earth.
3. Yes, because for many children this can be quite boring as it hasn’t got many interesting features, so children see that learning is fun.
4. It was very well organized. You had to go in an order so you didn’t have to go to some places twice and you didn’t miss anything by mistake.

PF-10
1. Statues, murals, information boards, stuffed animals of different species, various videos on mammals/reptiles/amphibians etc. Small computer programs set up.
2. That humans are not really doing enough to save their world and that they are just pushing the blame for the destruction of their environment upon one another.
3. The exhibition needs to be expanded in a way to make it more memorable. More activities including games, computers and videos need to be added for all ages.
4. It was a very useful and informative experience. I hope to go there again one day.

PF-11
1. I remember the display showing the different insects, which are found in the kitchen and where they can be found. I also remember the display of television screens showing different ways that water can be recycled.
2. The visit increasing my general knowledge and interest in ecology. It also put what I learned in my biology course into perspective.
3. I feel the exhibition was displayed very well allowing people who may not know very much about ecology to understand it. I found that it did not need to be improved.
4. -

PF-12
1. I like the way the exhibition was on different levels. I particularly liked the video screen wall. I found this was very effective. I also liked the mock rainforest display. It looked very inviting which made me want to go around the rest of the exhibition.

2. It helped to reinforce the knowledge I already had about ecology due to the exciting way it was approached.

3. May be it should be made a bit larger because it is such a good exhibition which attracts many people.

4. No.

PF-13
1. Not very much though after a long time thinking I remembered the setting of the walk through the rainforest.

2. Not very much as I am a biology student - it was interesting though, and I am sure it would teach others who don't take ecology as a main subject topic.

3. It needs to be made more lively - with things for the public to participate in to make a greater impression especially for children.

4. No, it was very enjoyable however.

PF-14
1. I remember the display of the earth and the mirrors, seeing large displays concerning food chains and human life. I also remember pressing buttons to reveal information.

2. I learnt about problems caused by humans to the earth; food chains and carbon cycle; ocean environments.

3. I think that the exhibition could be improved if there was less written information throughout the exhibition. The information could be shortened or displayed in picture or sculpture form. This would enable the information to be remembered more easily.

4. -
PF-15
1. When I visited the exhibition I remember seeing the section on a house. It showed bad hygiene and care and showed the consequences of pollution. Also what would happened to the earth if nothing is done about it.
2. From the visit I learnt that something needs to be done by everyone to help prevent global warming etc.
3. I think there needs to be models of the earth which should try and show the effects of global warming, destruction of ozone layer etc.
4. -

PF-16
1. The stuffed animals and dinosaurs, rainforest, TV screens.
2. Did not really learn anything as it was just a short visit and had no educational correspondence.
3. Needs to be made more interesting and exciting for younger members, although I found it very interesting and did enjoy the exhibits.
4. I thought the exhibition were OK but would be too technological for younger people - it would be an idea to have booklets with pictures to follow as you walk round.

PF-17
1. I thought I learnt a lot, the way, everything was set up, was very understanding. The sun and plants which gave me a lot of information.
2. I learnt about the work we done in more detailed and understood more as we were given examples.
3. No, I do not think so, but it would be nice to have had more practical things to do.
4. I think all children should visit the museum especially if they are studying science.
PF-18
1. I remember the large "globe" which was very impressive. I also remember the water and rubbish/pollution exhibitions.
2. As A level student, I did not learn many more theoretical things, but I enjoyed seeing it from a practical/different point of view.
3. It is rather simplistic from an A level point of view, but as most of its viewers are younger, this is expected. Extra, more difficult information would be useful.
4. -

PF-19
1. The leaf structure; ecology section with different animals representing different feeding levels; the video wall on ecology.
2. Biological terms.
3. I think it needs to be more "friendly" with more devices to encourage younger people to get interested in ecology at a younger age.
4. More diagrams/features on ecology on the way leading to different exhibitions or more "interesting" ways for people to remember what ecology is about.

PF-20
1. Visual flashbacks of exhibition displaying hydrological cycle, energy flow, mineral nutrient cycling.
2. The powerful force of the sun regarding the hydrological cycle, greenhouse effect, ozone layer depletion.
3. Yes, could do with showing local/national/international projects where people are contributing to a greener, safer environment and give information on how, where, with whom, one can engage in saving the environment.
4. n/a
PF-21
1. That there were lots of trees made to look like a rainforest and there was a big screen showing a video about wildlife and lots of models of animals.
2. I learnt that wildlife has to be looked after otherwise there will be none left.
3. No.
4. It felt like you were in a real rainforest with all the sounds around you.

PF-22
1. The earth shown in the mirrors, the visual displays - video wall; leaf factory; human impact on environment; display of important of animals for our medicine, food etc.
2. How organisms are dependent on each other for their survival. The devastating effect that humans have on the environment, that we rely on animals, insects etc.to live our lives as we do.
3. No.
4. No.

PF-23
1. The extent of the information given; presentation was excellent. I was so impressed by the whole exhibition. I took my godson to see it. He in only 3 years and was as fascinated as I was with it. The rainforest stays in my mind as a good feature.
2. Gave me a complete and comprehensive and logical illustration of ecology.
3. No.
4. No.

PF-24
1. The jungle corridor with the sound effects, the moving bulldozer and the huge exhibit about the planet (mirror).
2. The way that the earth works, the importance of plants and animals, and to conserve the planet.

3. I think that the exhibit needs more things that you can move (turn, pull) so that you are involved.

4. -

PF-25
1. Can't remember it.
2. Not very much as I am studying A level biology. However it was very interesting.
3. The exhibition needs to be more prolific in the natural science museum. There was a walk in woods. A walk in environment with stimulated activities and sound effects would be very effective.
4. It was enjoyable and novel.

PF-26
1. Tropical rainforest; ecosystems; the earth and its atmosphere; food chains; sound effects.
2. Nothing more that we had already covered in college since that we are science students (BTEC), but showed us a simpler ways of getting the message across.
3. Yes, to cater for older age ranges, eg.16+.
4. Very high tech and well presented.

PF-27
1. The television screens drew my attention. The corridor leading up to it was helpful.
2. I learnt about how the water is recycled and reused.
3. A colourful exhibition, the indoor plants made it more appealing. Lighting and more models may appeal to younger children.
4. It helped in the question on our assignments.
PF-28
1. The huge tree stump; the animals.
2. That man is not doing enough to save our planet and that everyone is responsible, in helping.
3. May be some activities for younger children to learn about. Maybe freebies so we can remember of visit and what we have been taught.
4. It was very useful and I learned a lot.

PF-29
1. The area about recycling the rabbit and man's effect upon the environment; the use of the JCB was very effective.
2. It gave me a greater understanding of what I already knew.
3. No, the exhibition does not need to be improved. There could one improvement, more access for people in wheelchairs.
4. No.

PF-30
1. I remember the large leaf structure which lit up as the structure of the leaf was explained, and the information about food chain/webs.
2. The main thing that I learned was about the leaf, but also other factors that I knew were enhanced from the ecology visit.
3. No.
4. No.

PF-31
1. I remember seeing the mammals, dinosaurs, the rainforest, and seeing and learning about all different parts of the environment. I remember watch short videos.
2. I learned about the planet and about the environment.
3. No, I thought that it was very interesting and I learned a lot from it.
4. No.

PF-32
1. A very impressive exhibit; plenty loads to do and see.
2. Nothing specific (as I wasn't particularly looking!).
3. No, it doesn't.
4. Superbly displayed and captured my interest at the time. Since my visit I have recommended this exhibit to friends who are going to visit the museum.

PF-33
1. I remember that we saw the ecosystem and all the animals that live in the ecosystem.
2. I learned about environment and the numbers of environments.
3. No, it was very nice.
4. We saw every particular living organism takes place and are related to each other.

PF-34
1. I remember the mammals, dinosaurs and I especially remember the rainforest.
2. I learnt about the effects, different...of effects that can happen to our environment and to our animals.
3. No, I don't think it needs to be improved, it was quite an interesting experience.
4. No.

PF-35
1. About the different sections in maintenance of life.
2. I learnt more knowledge about this module.
3. I enjoyed the visit, but I think there should be more things that we could do
something like a launch pad.

4. Yes, we got stuck in the lift.

PF-36
1. I remember the "creepy crawlies" section of the ecology exhibition which was very interesting.
2. From the exhibition I learnt things I did not know, but most I already knew.
3. No, I think the exhibition showed all the facts clearly and presented it beautifully.
4. No.

PF-37
1. The plants; large screens; silky inside plant leaf.
2. More about food chains and man's effect on the environment.
3. Perhaps amount of text next to pictures should be reduced and numbers of pictures and photos increased.
4. Well presented - clear pictures; good audio effects.

PF-38
1. I remember a great many things about the ecology exhibition but the size of the animals struck me most, when you see them together how small or large they really are.
2. -
3. I enjoyed the exhibition and I didn't think it could be improved.
4. -

PF-39
1. I thought the "creepy crawlies" section which was very interesting.
2. I learnt many new things - some things were a touch advanced for me.
3. No, I think it is adequate enough as it is. It conveys the facts reasonably
4. No.

PF-40
1. Dinosaur and ecology; how water is formed and the type of dinosaur that existed.
2. Many things about dinosaurs that I’ve never heard before.
3. In future maybe, to get and gather more valuable information and evidence about dinosaurs etc.
4. No.

PF-41
1. Mostly the area on water, ocean, hydropower etc.
2. Basic of ecology; environments globally; developing of ecology.
3. It doesn’t need any improvement in my opinion.
4. Very educational but also entertaining with the use of visual aids and some effects.

PF-42
1. The giant television was very effective; sound effects very good; giant digger; rainforest effective.
2. I found the earth’s atmosphere section very informative and interesting.
3. More seating, eg. in front of television, at photos etc.
4. No.

PF-43
1. The large television screens talking about water and things; walking through passage looking at various animals and displays.
2. We learned about water.
3. No, it was a good exhibition as it was.
4. It helped with our assignment questions.

PF-44
1. The circulation of the animals, water, dinosaurs....
2. Lots of things such as the animals, plants and insects how they survive.
3. I don't think it should, because it is well done organized.
4. No.

PF-45
1. Nothing much.
2. Nothing new at all before, but nevertheless an enjoyable experience.
3. It needs to be more memorable. Make it more like the human biology exhibition (more emphasis on audience participation).
4. No.

PF-46
1. Not a lot.
2. Nothing that I can remember.
3. The exhibition needs to be improved so that it will be more interesting, so more people will actually look, listen to what's going on.
4. No.

PF-47
1. Seeing the rainforest and different animals.
2. I knew a lot beforehand, but also I gained new experience.
3. No, I thought the exhibition was well planned and laid out.
4. No.

PF-48
1. I remember the rainforest exhibition and walking through on the walk way
through the exhibition. Interesting sections of exhibition.

2. Various aspects and ecology including diversity and rainforest.

3. No.

4. -

PF-49
1. I found the exhibits interesting.
2. I have been able to relate my college studies to the exhibition.
3. No.
4. I found the exhibition very interesting and would go again.

PF-50
1. The tree that started healthy and ended rotten; the planet display; the sounds; the big weather TV.
2. How to put together a good exhibition.
3. No.
4. -

PF-51
1. Nature is beautiful.
2. We should take care of this earth.
3. Yes; our influence on nature.
4. We should go there often to learn more about our bad behaviour towards nature.

PF-52
1. Mirror effects of life, waterfall, seeds growing.
2. It's fun away from college.
3. Not intelligent enough to answer that !
4. There should be more on man's influence on environment - pollution.
PF-53
1. Trees, all animal sounds etc; rainforest; information boards; logs to sit.
2. Have to look after the earth better.
3. This exhibition does not really need to be improved.
4. -

PF-54
1. We saw a jungle; we also saw dinosaurs; and trees.
2. It was to do with our environment project and it gave us ideas.
3. -
4. I enjoyed it.

PF-55
1. The different habitats.
2. A little about habitats but nothing substantial.
3. It needs to be improved - does not hold you interested very long.
4. Requires more activities.

PF-56
1. A big display of trees/forest in the entrance; small bits of information and animal noises.
2. How to look after the earth.
3. No.
4. No.

PF-57
1. The rabbit and stuffed animals.
2. A little on conservation.
3. Yes, it was confusing, lack of signs around the walk way and the symbolic path.
4. Simplified labels.

PF-58
1. The inter-relatedness of the earth.
2. How dependent each component...on one another.
3. No, it was adequate enough.
4. No.

PF-59
1. Relationship of the environment, biological interactions.
2. All components in nature relate in important ways.
3. No, it doesn't. It's a very complete and educative exhibition.
4. -

PF-60
1. Just the general visit really, it was a year ago.
2. Not much; water cycle.
3. Yes, so that we remember it.
4. No.

PF-61
1. The formation of earth; ecosystem (food chain); human impact on the environment.
2. -
3. I think that it is pretty enough.
4. No.

PF-62
1. The walk round.
2. Life cycle and conservation.
3. Clearer signs - more information boards highlighting main aspects.
4. It was fun for a museum.

PF-63
1. The large orbital glass dome/global/sphere.
2. The rainforest.
3. Easier labels, more readily available information.
4. The walk way was confusing.

PF-64
1. Sphere and mirrors; sayings the walls.
2. Know most already.
3. For A level, it was not really as deep as needed.
4. -

PF-65
1. I found it extremely interesting.
2. I've just been able to relate my college work to this area.
3. No.
4. Very enjoyable.

PF-66
1. The interrelationship between animals, plants, biosphere, atmosphere.
2. As above.
3. No, it was very well organised.
4. Specially not.

PF-67
1. Very educational.
2. My college studies have bettered.
3. No.
4. I would visit the place again.

PF-68
1. I can't really remember much.
2. Not much.
3. Yes, to make it more memorable.
4. No.

PF-69
1. Not a lot.
2. How the environment is made; things about the earth.
3. No.
4. No.

PF-70
1. Different habitats.
2. Not much.
3. Yes, people need to get more involved.
4. No.

PF-71
1. Nothing.
2. Yes, I did learn but I don't remember.
3. Don't know.
4. No.

PF-72
1. Nothing.
2. I can't remember.
3. Yes, make it more memorable.
4. No.

PF-73
1. Video display on water cycle.
2. Not a lot.
3. It's OK.
4. -

PF-74
1. -
2. The importance of its nature system regarding as ecology.
3. -
4. -

PF-75
1. I don't remember anything.
2. Nothing much.
3. Yes.
4. No.

PF-76
1. The dinosaurs.
2. The processing of the planet.
3. No.
4. -
APPENDIX 27:

TRANSCRIPTION OF THE STREET INTERVIEWS ON ECOLOGY WITH PEDESTRIANS IN LONDON

The interviews were conducted by J.H. Iguchi, this author from 4th to 8th February in 1994 (5 days), mostly in popular and famous parks in the centre of London, that is Regent's Park, Hyde Park, Green Park, St James's Park, and around Big Ben (Parliament area). All interviews were tape-recorded and transcribed. The street interview form and the transcription are shown as follows.

NOTE:

1. The number showing before respondent's gender is the order of the interview.
2. Middle-aged is from 31 to 60 years old, and elderly is over 61 years old in this thesis only.
3. The transcription comes directly from original tapes recorded, hence it might include some grammatical incorrect sentences and slang.

STREET INTERVIEW FORM FEBRUARY 1994

Ask that:

"Excuse me? I am a PhD researcher on ecology in the University of London. Would you mind answering some questions on ecology? These should only take a few minutes? Now, first question is:

1. What does ecology mean? I will give you some hints, that is:
   the study of the relationships between
   1) animals and plants.
   2) ultraviolet rays and skin cancer.
3) living organisms and their physical environment.
4) man and the environment.

2. Could you list some environmental issues?
3. Have you ever taken part in any events on environmental issues?
4. To what extent, are you prepared to change your life-style to help "Save the Earth"?

   not at all                                   a great deal
   1          2          3          4          5

5. Whose future responsibility is it to help "Save the Earth"?
   Please choose one.
   1) Government
   2) employers
   3) conservation groups
   4) individual persons

6. If there was a very attractive exhibition on ecology, describing "human impact on the environment", would you go to see it?

   definitely no                                   definitely yes
   1          2          3          4          5

   (Now, the Natural History Museum in South Kensington exhibits ecology using the newest technology. Open seven days. Welcome to the Natural History Museum.)

7. Finally, would you mind if I asked you about your education and nationality? Such as:

   1) secondary school (up to 16)
   2) sixth form college (up to 18)
   3) first degree (e.g. BA,BSc,etc.)
   4) higher degree (e.g. PGCE,MA,MSc,MPhil,PhD,etc.)

   Nationality:

Thank you very much indeed for your time. Have a nice day!
Now, I am going to start the street interviews for the main study on Saturday morning 5th February in 1994 in Regent’s Park in London.

1. Male in his fifties
   1) 3
   2) Pollution; over population; a great many of course...they are the two major ones.
   3) No.
   4) 5: I have already changed my life style in line with saving energy.
   5) All of them.
   6) 1: No, I mean I don’t see how any exhibition would tell me anything...exhibition is totally waste time. People have not seem to be educated these issues.
   7) 4 (PhD), British.

2. Male in his twenties
   1) 1
   2) My knowledge of English is not good.
   3) Working in the zoo.
   4) 3
   5) 4
   6) 5
   7) 2, Yugoslavian.

3. Male in his late twenties
   1) 3
   2) Ozone layer; general pollution; industrial...traffic, overcrowding, overpopulation.
   3) Against fox hunting. National Trust is interested in preserving historical things and I am a rambler.
4) 3
5) 1
6) 3
7) 4, duel nationality: British-American.

4. Elderly male
   1) Don't know.
   2) Too big words for me...you are a very high educated man.
   3) No.
   4) 5
   5) 1
   6) 5
   7) 1, Irish.

5. Male in his fifties
   1) 4
   2) Pollution; overpopulation; loss of habitats for wildlife; being crowded; greenhouse effect which could change the climate; road development; urban development; public transport rather than encouraging use of cars; city planning; management of the oceans and deserts....
   3) No.
   4) 3: ...One person changing the life-style in isolation cannot do much good ...in fact it could do more harm. People think you are a nut-case but if governments acted...across the Europe...like restricting the use of cars...then I would go along with that.
   5) 1
   6) 4 and 5
   7) 2, British.

6. Male in his sixties
1) 3
2) Ozone layer; carbon dioxide production; passing of genic agents in environments e.g. benzine, nitro oxide; disappearance of some wildlife; shrinkage of biodiversity; radioactivity; over human population.
3) No.
4) 3: I would not give up my car. I don't smoke so can't give that up, so I don't think I am a very bad person.
5) 1: Only the Government can employ laws and the business of educating individual people they don't listen to education.
6) 5
7) 4 (I am a professor of the BPME (British Postgraduate Medical Federation), British.

7. Male in his fifties
1) 3
2) Car exhaust; artificial additives for food; overdevelopment.
3) No. I divided rubbish into bottles and cans before dustmen correct them.
4) 5: I am aware of environmental issues. I don't use my car very often. Today I came here on foot. Now I'm going to the British Museum.
5) 2 and 1
6) 4
7) 3, Japanese.

8. Female in her twenties
1) 4
2) Acid rain; ozone layer; waste something.
3) No.
4) 3
5) 1
6) 5
7) 3, British.

9. Male in his late fifties
   1) 4
   2) Rainforest; population; ozone layer.
   3) No.
   4) 5
   5) 4
   6) 5
   7) 1, British.

10. Female in her twenties
    1) 3
    2) Pollution of cars; traffic; industry.
    3) Yes...collected money for Friends of the Earth.
    4) 3: Not sure...too complicated thing.
    5) 1
    6) 3
    7) 4 (MA), British.

11. Female in her forties
    1) 4
    2) Emissions from factories; the use of land without putting it back e.g. trees; polluting the water; destroying some species of animals; smoking; passive smoking.
    3) I belong to the Sierra Club in the States which is concerned with environmental issues.
    4) 5: ...I gave up smoking.
    5) 4
    6) 5
7) 4 (Master), American.

12. Female in her forties
1) 3
2) Overpopulation; deforestation; pollution; ozone layer; animals
overgrazing; crops; fertilizers; dams; roads; bridges.
3) No.
4) 2: Because it needs everybody to change their life-style, not just me.
You need a law to make it, so "4".
5) 1
6) 3
7) 2, British.

13. Middle-aged male
1) 4
2) Air pollution; ...too many cars; trouble with animal products.
3) No.
4) 4
5) 4
6) 5
7) 4 (MPhil), American.

14. Middle-aged male
1) 1
2) Air and water pollution; danger in plant and animal species; resources
issues; using up non-renewable resources.
3) Yes, nuclear power plant.
4) 4
5) 1: All of the above...just one? Government.
6) 4
7) 4 (Master), American.

15. Male in his twenties
1) 3
2) Deforestation.
3) Recycling project.
4) 5
5) 4
6) 5
7) 3, Japanese.

16. Female in her late teens
1) 4
2) Destruction of the rainforest; ocean pollution due to oil spill; extinction of animals due to lack of environment; fishing; loss of large schools of fish like cod and trout.
3) Once....
4) 3, 4, 5.
5) 2 and 1
6) 5
7) 2, Canadian.

17. Female in her early twenties
1) 3
2) Greenhouse effect; pollution; land filling; rainforest.
3) No.
4) 4
5) 4
6) 4
7) 3, British.
18. Female in her fifties
   1) 3
   2) Global warming; ozone layer; disappearance of rare plants and animals; pollution of the environment by traffic exhaust.
   3) No.
   4) 3
   5) 4
   6) 5
   7) 4, British.

19. Male in his thirties
   1) 3
   2) Pollution (unclear).
   3) No.
   4) 4 and 5
   5) 4
   6) 4
   7) 3, British.

20. Elderly female
   1) 4
   2) Street rubbish; recycling; air pollution.
   3) No (unclear).
   4) 5: already changed.
   5) 4
   6) 3
   7) 2, British.

21. Female in her twenties
   1) 4
2) Ozone; pollution.
3) No.
4) 4
5) 4
6) 5
7) 3, Spanish.

22. Elderly female
   1) 1
   2) Don't know.
   3) No.
   4) 5
   5) 1
   6) 5
   7) 1, British (come originally from Austria).

23. Male in his twenties
   1) 3
   2) Pollution; power stations; atmospheric issues like emission CO2 warming up the atmosphere; ozone layer.
   3) No, but I am a member of Friends of the Earth.
   4) 5
   5) 4
   6) 5
   7) 4 (PhD), British.

24. Female in her early twenties
   1) 3
   2) Global warming; rainforest.
   3) No.
25. Male in his sixties
   1) 3
   2) Global warming; polluting of seas; radioactivity.
   3) No.
   4) 3
   5) 4
   6) 4
   7) 1 (I left school when I was 11), Irish.

26. Male in his late sixties
   1) 1
   2) I watch David Attenborough...this world will come to an end if we do not
      look after the animals...I do believe in God as a spiritual being.
   3) I used to save animals.
   4) 5
   5) 4
   6) 3
   7) 1 (I left school when I was 14), British from Northern Ireland.

27. Female in her twenties
   1) 3
   2) Global warming; ozone pollution; rainforest depletion.
   3) No.
   4) 4
   5) 1
28. Female in her early twenties
   1) 3
   2) Pollution; industrial productions; conservation of water; meat productions.
   3) No.
   4) 4
   5) 1
   6) 5
   7) 3, British.

29. Male in his late twenties
   1) 4
   2) Radioactivity; nuclear disasters; oil tank spillage; general pollution; industrial pollution.
   3) No.
   4) 4
   5) 4
   6) 4
   7) 3, dual nationality British-American.

30. Female in her thirties
   1) 4
   2) Effects on the environment...like factories.
   3) No.
   4) 5
   5) 4
   6) 5
7) 2, British.

31. Male in his late teens
   1) 3 (unclear)
   2) Ozone layer; whales; pollution; chemical plants... (unclear)...
   3) No.
   4) 5
   5) 1
   6) 4
   7) 3 (studying to be a doctor), British.

32. Female in her fifties
   1) 3
   2) Rainforest; ozone layer; greenhouse effect; destruction of countryside and habitats; pollution of water.
   3) I belong to various organizations... I went on a demonstration outside the American Embassy.
   4) 5
   5) 4
   6) 5
   7) 3, British.

33. Male in his late twenties
   1) 3
   2) Ozone; conservation of rainforests; maintain species.
   3) No.
   4) 4
   5) 4
   6) 3 and 4
   7) 3, British.
34. Elderly female

1) 3  
2) Pollution; dolphin and tuna issues; nuclear question; power lines and cancer.  
3) No, recycling.  
4) 4  
5) 4  
6) 5  
7) 3 (natural science), canadian.

35. Male in his late teens

1) 3  
2) Ozone layer; greenhouse effect; deforestation; pollution of the sea; overpopulation; famine and drought; over farming of land.  
3) Only recycling.  
4) 3  
5) 4  
6) 4  
7) 3 (university student), British.

36. Female in her fifties

1) 4  
2) Conservation of animals and land; air pollution.  
3) Yes, a demonstration.  
4) 4  
5) 4  
6) 4  
7) 4 (Master in economics; lawyer), Spanish.
37. Male in his late fifties
   1) 4
   2) Ozone problem; destruction of water through pesticides; beginning of lack of resources in fuel....
   3) Yes...I was in the organising a committee of the Eurochannel of commerce and Industry which organises a major conference with 2,500 participants on environmental issues in June 1992 in Geneva.
   4) 3
   5) 4
   6) 5
   7) 4 (Master in law), Swiss.

38. Female in her late fifties
   1) 3
   2) Ozone layer; carbon dioxide; acid rain; overpopulation; desert.
   3) Biology teacher in Sweden.
   4) 4
   5) 1
   6) 5
   7) 3, Swedish born in Hungary.

39. Female in her late teens
   1) 3
   2) Many problems...air pollution in Hong Kong; water pollution.
   3) No.
   4) 3
   5) 4
   6) 4
   7) 1, Chinese from Hong Kong.
40. Elderly female

1) 3

2) Keeping green parts of the world; less fumes and cars; keeping whales; living way of life.

3) No.
4) 4
5) 4
6) 3
7) 2, British.

41. Male in his twenties

1) 3

2) Pollution a bit; ozone.

3) No.
4) 3
5) 4
6) 5
7) 3, British.

42. Male in his fifties

1) 1

2) Pollution; rainforests destroyed; sea being polluted; wildlife and atmosphere being destroyed; very poor planet.

3) No.
4) 5
5) 4
6) 3
7) 2, British.

43. Male in his twenties
1) 4
2) Pollution; acid rain; ozone holes....
3) No.
4) 4
5) 1
6) 5
7) 4 (PhD), British from India.

44. Male in his twenties
   1) 1
   2) Saving the animals.
   3) No.
   4) 3
   5) 4
   6) 3
   7) 3, Danish.

45. Female in her twenties
   1) 3
   2) Water and air pollution; noise.
   3) No.
   4) 5
   5) 4
   6) 4
   7) 3, Japanese.

46. Female in her twenties
   1) 3
   2) Nuclear energy; Killing whales; ozone layer; greenhouse effect.
   3) No,
47. Male in his fifties
1) 4
2) Ozone layer; whales; rainforest.
3) No.
4) 3
5) 4
6) 3
7) 1, British.

48. Female in her twenties
1) 4
2) Save natural environments; global warming.
3) Recycled packages.
4) 5
5) 4
6) 4
7) 3, Japanese.

49. Female in her twenties
1) 4
2) Net fishing; endangered species of animals; Brazilian rainforest.
3) No.
4) 3
5) 4
6) 4
7) 3, New Zealander.

50. Male in his thirties
1) 4
2) (unclear)
3) No.
4) 3
5) 1
6) 4
7) 3, Italian.

51. Middle-aged male
1) 4
2) Pollution; holes in ozone layer; overcrowding; over buildings; whales.
3) No.
4) 3
5) 4
6) 4
7) 4 (solicitor), British.

52. Elderly male
1) 1
2) Global warming; ozone layer.
3) No.
4) 1
5) 1
6) 2
7) 3, British.

53. Male in his early twenties
1) 3
2) Greenhouse effect; radiation (radioactivity) in the home; pollution; nuclear waste; cutting down rainforests; endangered species.
3) Cleaning up the parks in New York City picking up litter...supported Greenpeace.

4) 4
5) 4
6) 4
7) 3 (BSc), American.

54. Elderly male
1) 4
2) No.
3) No.
4) 3
5) 1
6) 3
7) 1, British.

55. Middle-aged male
1) 3
2) Pollution; rainforests; whaling; slaughtering animals; tree farming; use of chemicals in agriculture.
3) No.
4) 4
5) 4
6) 5
7) 4 (Master), British.

56. Middle-aged male
1) 3
2) Air pollution; sea pollution; destruction of forests.
3) No.
4) 3
5) 1
6) 5
7) 3, British.

57. Female in her late teens (roller-skating)
   1) 1
   2) Ozone layer; nuclear waste.
   3) No.
   4) 5
   5) 1
   6) 5
   7) 2 (doing A level), South African.

58. Female in her twenties
   1) 3
   2) No.
   3) No.
   4) 5
   5) 4
   6) 4
   7) 3, Dutch.

59. Elderly male
   1) 3
   2) -
   3) No.
4) 4
5) 4
6) 3
7) 3 (BSc), British.

60. Elderly female
1) 4
2) Rubbish tipping.
3) No.
4) 3
5) 1
6) 5
7) 1, British.

61. Female in her late teens
1) 3
2) Pollution; acid rain; extinction of animals; erosion of the earth.
3) In my class.
4) 4
5) 1
6) 5
7) 3, American.

62. Female in her late teens
1) 3
2) Greenhouse effect; hole in the ozone layer; rainforest being destroyed.
3) No.
4) 4
5) 4
6) 3
7) 3 (student), American.

63. Female in her late teens
   1) 3
   2) Cars; rubbish in the streets.
   3) A member of World Wide Fund for Nature.
   4) 5
   5) 4
   6) 5
   7) 2, Italian.

64. Middle-aged female
   1) 4
   2) Traffic pollution, dumping waste; dumping things in the sea; animal farming and what they eat and then we eat them; live animal cargoes going to Europe.
   3) No.
   4) 4
   5) 1
   6) 5
   7) 2, British.

65. Female in her late teens
   1) 4
   2) Ozone layer; rainforest; endangered species.
   3) No.
   4) 3
   5) 4
   6) 3
   7) 3, American.
66. Elderly female

1) 4

2) Ozone layer; battery and intensive farming; noise pollution from airplane and car engines.

3) No.

4) 3

5) 1

6) 3

7) 1, British.

67. Male in his twenties

1) 3

2) Dog dung in the parks.

3) No.

4) 3

5) 4

6) 3

7) 3, Japanese.

68. Elderly male

1) 1

2) Green forests; clean water; chemical pollution; motorcar fumes; river pollution.

3) No.

4) 5

5) 4

6) 4

7) 4 (PhD in philosophy), Italian.
69. Elderly male
1) 4
2) Water pollution; carbon dioxide.
3) No.
4) 3: Too late to change for my age.
5) 1
6) 3
7) 1, British.

70. Female in her twenties
1) 4
2) CFCs; oil pollution; any sort of pollution; litter; rubbish tips; give off lots of gasses.
3) Only recycled.
4) 3
5) 4
6) 4
7) 2, British.

71. Elderly female
1) 3
2) Ozone layer; amount of carbon in the air as a result of industry and motorcar.
3) Yes, until a year ago.
4) 4
5) 1
6) 4
7) 3 (BA), British.

72. Female in her late teens
1) 3
2) Water pollution; ozone layer; air pollution.
3) No, just recycling.
4) 4
5) 1
6) 4
7) 3 (BA), American.

73. Middle-aged male
1) 3
2) Car pollution; water pollution; ozone layer.
3) No.
4) 3
5) 1
6) 5
7) 3 (I'm a dentist), British.

74. Middle-aged male
1) 3
2) Ozone layer; pollution of rivers and waters; pollution of air.
3) No.
4) 4
5) 4
6) 4
7) 2, British.

75. Female in her twenties
1) 3
2) Ozone layer; depletion of rainforest.
3) No.
4) 3
5) 1
6) 3
7) 3 (BA), British.

76. Female in her teens
1) 1
2) Pollution; rubbish.
3) Yes (unclear)
4) 3
5) 4
6) 2
7) 2, German.

77. Middle-aged male
1) 4
2) Ozone; chemical waste; rainforest in Brazil.
3) No.
4) 5
5) 1
6) 5
7) 4 (MA), Lebanese.

78. Female in her late teens
1) 3
2) Air pollution.
3) Recycling rubbish.
4) 5
5) 4
6) 5
7) 3, Turkish.

79. Male in his late fifties
   1) 4
   2) Atmosphere; water pollution; soil pollution concerning water, air, atmosphere.
   3) No.
   4) 5
   5) 4
   6) 2
   7) 2, British.

80. Elderly female
   1) 4
   2) Pollution; Keeping green.
   3) No.
   4) 5
   5) 3
   6) 3
   7) 2, British.

81. Female in her teens
   1) 3
   2) Pollution; Ozone layer; Constructing buildings.
   3) No.
   4) 4
   5) 4
   6) 4
   7) 3, Australian.
82. Elderly female
1) 1
2) Taking cars off roads; bringing down price of public transport.
3) No.
4) 3
5) 1
6) 3
7) 1, British.

83. Male in his teens
1) 3
2) The earth and organisms; greenhouse effect; ozone layer; pollution; toxic waste.
3) Yes...really in Cheltenham about dumping toxic waste nearby and a Green Peace rally in London.
4) 4
5) 4
6) 4
7) 2 (I did apprenticeship in further education and next year doing a degree), British.

84. Female in her early twenties
1) 3
2) Pollution; ozone layer; destruction of species of animals and their habitats.
3) No.
4) 3
5) 4
6) 5
7) 3 (I went a public school and now doing a degree), British.
85. Middle-aged male
1) 2
2) Cannot remember.
3) No.
4) 3
5) 3
6) 1
7) 1, British.

86. Elderly female
1) 2
2) Exhaust fumes....
3) No.
4) 3
5) 1
6) 3
7) 1, British.

87. Male in his late twenties
1) 2
2) Don't know.
3) No.
4) 3
5) 4
6) 3
7) 3, Indian.

88. Middle-aged male
1) 4
2) (unintelligible)
3) Yes, signed on a letter to ask the Government.
4) 3
5) 4
6) 3
7) 3 (writer), Georgian (between Russia and Turkey).

89. Male in his late teens (street beggar with tattoos)
   1) 2
   2) Not going like...could make it better....
   3) No.
   4) 5
   5) 1
   6) 3
   7) Never went to school, British.

90. Male in his teens
   1) 4
   2) Pollution; extinction of animals; ozone layer; greenhouse effect.
   3) Yes.
   4) 4
   5) 4
   6) 4
   7) 2, Greek.

91. Male in his teens (hippie)
   1) 4
   2) Global warming; acid rain; pollution; disease; rainforest.
   3) No.
   4) 2
5) 1
6) 2
7) 2, British.

92. Female in her late fifties
   1) 3
   2) Keeping animals; pollution.
   3) Recycled paper
   4) 5
   5) 4
   6) 5
   7) 3, British.

93. Female in her late fifties
   1) 4
   2) Experimentation in laboratories escaping virus in environments; waste plastic bags; TV shows just violent, must shows environmental problems.
   3) No.
   4) 5
   5) 4
   6) 5
   7) 3 (BSc), dual nationality: Chinese-Philippine.

94. Female in her late fifties
   1) 4
   2) Pollution; destruction of habitats for animals; pollution of sea; water pollution.
   3) No.
   4) 4
   5) 4
6) 3
7) 3, British.

95. Middle-aged female
1) 4
2) Pollution; car fumes; factory chimney emissions.
3) No.
4) 3: (unclear)
5) 1
6) 3
7) 1, British.

96. Middle-aged female
1) 4
2) Clean air; non-toxic waste.
3) No.
4) 5
5) 4
6) 4
7) 2, British.

97. Female in her fifties
1) 3
2) Pollution; ozone layer.
3) No.
4) 4
5) 1
6) 3
7) 4 (MSc), British.
98. Female in her sixties
   1) All connected.
   2) Ozone layer; deforestation; chemical waste; dumping of nuclear waste.
   3) Yes, I used to attend...Green Peace and Friends of the Earth.
   4) 5
   5) 4
   6) 5
   7) 3 (two degrees), Persian (Iranian).

99. Female in her thirties
   1) 3
   2) Greenhouse effect; pollution; extinction of certain animal species; overpopulation of mankind.
   3) No.
   4) 5
   5) 1
   6) 3
   7) 3, British.

100. Female in her forties
    1) 3
    2) Car fumes; river pollution; rainforest.
    3) No.
    4) 3
    5) 4
    6) 5
    7) 2, German.

101. Female in her thirties
    1) 3
2) Nature; animals; saving the planet; buy green goods; unleaded petrol.
3) No.
4) 3
5) 1
6) 3
7) 2, British.

102. Female in her forties
   1) 3
   2) Greenhouse effect; water pollution....
   3) No.
   4) 4
   5) 4
   6) 3
   7) 2, British.

I have now finished 102 interviews near Big Ben on 8th February 1994, 3.55 pm.
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