

National Museum of Natural History

A Brief Guide



MAIN EVENTS AT NMNH

January

- ◆ Braille Day (4th Jan)

February

- ◆ World Wetland Day (2nd Feb)
- ❖ Programme For Disabled
- Science Day (28th Feb)

March

- ◆ World Forestry Day (21st Mar)
- ❖ World Day for Water (22nd Mar)

April

- ◆ World Heritage Day (18 Apr)
- ❖ Earth Day (22nd Apr)

May

- ◆ Summer Programme (15 May-15 June)
- ❖ International Museum Day (18th May)
- International Day for Biological Diversity (22 May)
- World No Tobacco Day (31st May)

June

- ◆ World Environment Day (5th June)
- ❖ Summer Programme Valediction
- World Day to Combat Desertification (17th June)

July

- ◆ Van Mahotsav (1-7 July)
- ❖ World Population Day (11th July)

August

- ◆ Orientation Workshop for Teachers

September

- ◆ International Day for Preservation of the Ozone Layer (16th Sep)

October

- ◆ Wildlife Week (2-8 Oct)
- ❖ World Habitat Day (5th Oct)

November

- ◆ National Education Day (11 Nov.)
- ❖ National Environment Awareness Campaign (19 Nov - 19 Dec)
- National Heritage Week (19th - 25 Nov.)
- Conservation Day (25th Nov)

December

- ◆ National Pollution Control Day (2nd Dec)
- ❖ International Day for Disabled (3rd Dec)
- National Energy Conservation Day (14th Dec)
- National Environment Awareness Campaign Valediction (19th Dec)

ABOUT NATIONAL MUSEUM OF NATURAL HISTORY

Established in 1978, the National Museum of Natural History (NMNH) was a dream project of our Late Prime Minister Smt. Indira Gandhi. After returning from the Stockholm Conference on Human Environment in 1972, she decided that the country needed a first rate Museum of Natural History to display the rich natural heritage of the country. Accordingly the NMNH was established in 1972 and inaugurated on the 5th June, 1978. It was a historic occasion for the NMNH as its opening coincided symbolically with the World Environment Day to signify its role in non-formal and informal environmental education on conservation of nature and natural heritage of the country.

The Museum with the First Gallery on “Introduction to Natural History” slowly became a premier institution as a major centre of environmental education spreading environmental awareness through multimedia displays, hands-on objects and interactive programmes and activities for all types of visitors, and children in particular. A Discovery Room for Children was added to the Museum in 1979. On 5th June, 1983, a Second Gallery on “Nature’s Network: Ecology” was added. In 1987, an Activity Room for Pre-school children and a Third Gallery on “Conservation” were opened. Finally, a Fourth Gallery on “Cell-the Basic Unit of Life” became a part of the Museum in 1988, thus completing the Museum to its present infrastructure.

Realizing the fact that the benefits of such a national level Museum should not remain confined to

the national capital alone, a few Regional Museums were planned to extend the geographical coverage of NMNH. Accordingly, Regional Museums of Natural History were established for the Southern (Mysore), Central (Bhopal) and Eastern Regions (Bhubaneswar) of the country. Two more Regional Museums are being established for the Western (Sawai Madhopur) and North-Eastern Regions (Gangtok).

Under its regular educational activities, the Museum organizes many competitions on important occasions relevant to environment, biodiversity, conservation and natural heritage. The Young Environmentalist of the Year Award (YEYA) constituted by the NMNH in recent years, is a prestigious award given to a child selected through a national screening process. The award is given on the occasion of World Environment Day in New Delhi

The Museum has also excelled in a few thrust areas such as Museum Accessible Studies and Intangible Natural Heritage. In fact the NMNH is the first Museum in Asia to publish Braille publications for the benefit of Persons with visual impairments. It has also developed “Touch, Feel and Learn Gardens” in its RMNH (Mysore).

The NMNH has also been involved in “Festivals of India” and bilateral collaboration with many countries including Germany, UK and USA.

INTRODUCTION

The NMNH welcomes you to a stimulating intellectual, visual and participatory adventure into the history of nature - a journey through time and space into the riddles and realms of the natural world with its exhibits on geology, botany and zoology.



A life size model of a dinosaur - Allosaurus in the front of the museum

The NMNH is located at the corner of the Tansen Marg–Barakhamba Road on the Mandi house roundabout. A life-size model of Allosaurus, a

dinosaur which ruled the worlds earlier, standing in the lawns of the Museum building has become the identification mark of the NMNH.

As one enters the Museum building just after crossing the reception area he/she is received by a



Mohan - the one-horned Indian Rhinoceros

life-size mounted model of ‘Mohan’ - the one-horned Indian Rhinoceros, which also serves as the logo of the Museum.

GALLERY I: INTRODUCTION TO NATURAL HISTORY

In the Gallery I on the mezzanine floor of the Museum, a geological time chart indicates the probable dates of origin of different kinds of life forms. In the evolutionary history of the Earth several different kinds of plants and animals appeared and evolved. However, most of them became extinct with time as they were not able to adapt themselves to the changing conditions on the



An ammonite fossil—a touch exhibit

Earth. From the lineages of the surviving ancestral plants and animals arose the present day plants and animals.

The universe is vast, beyond anybody's imagination. In comparison Mother Earth is only a few millimicrons in size. In the mezzanine on one corner of the roof one can find a model of the endless and ever expanding universe and visualize the size of the solar system in comparison to that of the universe. Our solar system is a part of galaxy—the *Milky Way*. This galaxy is comprised of millions of stars similar to that of the Sun, the centre of our own solar system. Andromeda

is our nearest galaxy that lies some few million light years from the Earth.

Natural History i.e. the history of nature, has always been a subject of fascination. How old is our Earth? How life came into existence and what conditions made it to evolve only on Earth and why not on any other planet? These are some of the questions that occasionally come up when we talk about Natural History of Earth.

How it all began?

In a highly captivating and dramatic landscape inside the Gallery I, one travels through 4500 million years from the birth of our Earth and explores the mysteries of the pre-historic life, its origin and evolution to the realms of the present day life.

A journey through time and space takes us to the marvels of the pristine Earth evolving from a hot nebula of gases after a huge cloud of diffused gases contracted and coalesced into Sun and its planets. Sun in the centre, started shining and became a star, while the planets started revolving around it. Still hot, as the dust clouds were settling down and solidifying the shape of the Earth was changing from an irregular diffused dense cloud to a solid spherical ball. Further evolutionary changes inside the Earth led to the formation of water-filled oceans, continents and mountain chains. Eventually, the conditions became stabilized and the Earth cooled down to the point where life could make its first appearance in oceans.

Life probably began in water, perhaps as early as 4 billion years ago. Recently discovered fossil remains of simple one-celled creatures, and inhabitants of shallow seas, provides evidence of existence of life on the Earth about 3.5 billion years ago. The fossil record is very sketchy until the Cambrian period, about 500 million years ago. Till this time many life forms had developed hard parts which enormously increased their chances of being preserved. The fossils of this period which are marine include the very early representatives of all the major divisions of the animal kingdom except vertebrates.

Life gained hold of the land in Silurian period about 400 million years ago. During this period plants appeared first as phytoplanktons. It was followed by Arthropods. The first vertebrate animal, the jawless fish, developed about 475 million years ago. A group of these fishes evolved into amphibians which colonised the land later.

Evidences of evolution

A fossil-bearing rock cliff in the Gallery I depicts evolutionary relics of the prehistoric life preserved as fossils. The rock depicts fossils of trilobites, a spiral mollusk called ammonites and brachiopods of lampshells. On view are some actual fossils of ammonite and bone of dinosaur. Believe it! These are the fossils of the life that existed some millions of years ago on the Earth. Why don't you touch them to have a feel of life which existed millions of years ago? Embryological, physiological and anatomical resemblances of the present day life with the prehistoric life are the evidences to the evolution of life.

Ecosystems

In the next section, one comes across a dazzling array of exhibits unveiling the life as it exists in various ecosystems such as pond, desert, mountain, under sea. Crocodiles in their natural habitat, birds at Bharatpur National Park and Tigers at Corbett National Park are depicted in life-sized habitat groups.

Plants for life

'Plants for life' is the theme of the next section of the gallery. Plants have several uses for mankind. Food, fibre and fuel, the basic necessities for human



Wildlife in a pine forest

life, have been fulfilled by the plants. List of economic uses of plants could be as long as one could think of. Plants also act as atmospheric purifier soaking up atmospheric carbon dioxide (CO₂) and releasing oxygen essential for animal life. Trees also modify the environment in many ways. In addition to acting as filters to clean up the atmosphere, plants also help in holding soil, regulating temperature, acting as air conditioners and so on.

India is endowed with a rich variety of over 46000 species of plants. This rich flora comprises of nearly 1700 species of flowering plants (Angiosperms), 2500 Algae, 1940 Lichens, 23000 Fungi, 64 Gymnosperms, 2700 Bryophytes and 1022 species of Pteridophytes. Depicted here is the classification of Plant kingdom, feeding and food producing activity of plants for themselves as well as for the entire living community. Pollination shown in plants is made possible by interdependence of plant and animal life.



An egret in its nest

Animal life

Animal life is as varied as plant life. They have been broadly classified into two groups: animals without backbones (invertebrates) and those with backbones (vertebrates). India's faunal diversity is as rich and varied as the floral diversity, comprising of nearly 81,000 species of animals. It constitutes about 397 species of Mammals, 1232 Birds, 460 Reptiles, 240 Amphibians, 2546 Fishes, 69903 Insects, 5072 species of Mollusks and other invertebrates

Animals without backbones

Animals without backbones are called invertebrates. They constitute about 95% of the total animal life on Earth. The perforated animals - *Poriferans* (sponges), the hollow cavity bearing animals - *Coelenterates*, the shell bearing animals - the *Mollusks*, the spiny skinned animals- *Echinoderms* and the joint-legged animals - *Arthropods*, all belong to invertebrates.

Animals with backbones

Animals with backbones are called vertebrates. They include Fishes, Amphibians, Reptiles, Birds and Mammals. Exhibits in the Vertebrate section of the Gallery I project evolutionary lineages and salient features of different groups of vertebrate animals.

Fishes, rulers of the water, continue to hold a successful 500 million years dominion in water and have evolved and adapted to live in some of the most extreme environmental conditions on Earth. Some fishes are protected by a kind of anti-freeze capability of blood and live in water below the freezing point. Some occupy caves in total darkness, in torrential streams and in water that is many times saltier than the sea water, in acid and alkaline water, in hot springs and under great pressure in the deepest parts of the sea. Some of the common fishes found in the river Yamuna are depicted here.

Amphibians

The creeping, crawling and hopping cold-blooded vertebrate animals belong to two separate groups, Amphibians and Reptiles. Amphibians live

equally well in water as well as on land. They have moist glandular skin and lack the protective covering of feathers or hairs seen in higher vertebrates. They lay their eggs in water or in moist places on land. Most of the young amphibians pass through a fish-like water-dwelling stage of development with gills used for breathing, before changing (metamorphosing) into air-breathing adults. Amphibians include animals like frogs, toads and salamanders.

Reptiles

Reptiles have evolved from a group of amphibians. They bear dry and scaly skin and live on land. They give birth to young ones or lay eggs on land. A reptile emerging from the egg is similar to its parents and breathes air. Reptiles flourished well at an early period of evolution, over 200 million years ago. A group of original reptiles gave rise to a variety of forms, including the terrible lizards, the dinosaurs. Warm-blooded mammals and birds evolved from another groups of reptiles.

Birds

No other group of vertebrate animals other than the birds and a few mammals, have the ability to fly. The visitor next comes across an exhibit depicting the skeletal framework of birds which enables them to fly. *Archaeopteryx* - the first bird to have stretched its wings and took to air about 150 million years ago, is thought to be the early ancestor of birds. The fossil record of this primitive creature also indicates a transition of a group of reptiles into birds. Its skeleton reveals the reptilian origin of birds with striking modifications.

Many of the bones in birds are hollow which enable them to lift up during flight. The powerful muscles attached to the greatly enlarged keel of the breast bone help them drive their wings. The framework of the wings in flying birds is well suited to its dual function of propulsion and lift. Bones of the end part of the wings i.e. hands, are united into a solid unit that supports the rotating and up-and- down movement of wings during flight, while the other part of wing closer to the body serves mainly for lift. The string of vertebrae found in reptiles has been replaced by a solid nub of bones in birds to hold the spread-out feathers of tail.



A leopard with its kill atop a tree

Birds have a variety of food to feed on. Adaptations of beak and feet in different birds are also as per their feeding and living habits. Look at the size, shape and colour pattern of as many varieties of eggs as there are birds. A good collection of colourful Indian birds fascinate both young ones and grown-ups alike as people hardly get a chance to see them around in the cities now.

The easy visibility of birds and their nature make them an ideal subject of study. Some aspects of

courtship, nest building and migratory behaviour are built-in and appear automatically at an appropriate time. Migratory birds surprisingly cover long distances between their nesting areas and wintering grounds. Some birds come to the same nesting sites year after year covering thousands of kilometers and return to their winter grounds with their young ones, once the mating and nesting season is over. The mechanism that governs such behaviour is not yet fully understood, but studies have proved that the migratory birds have

many navigational clues such as angle of sun in the sky, the positioning of the stars and even the earth's magnetic field. These are believed to be the factors governing the birds to follow same path every year. The flight paths followed by some of these migratory birds to India are depicted in the exhibit.

Mammals

Mammals are the only warm-blooded vertebrates with fur or hair. Their young ones are fed by mothers. Mice, cats, dogs, horses, elephant, whales, monkeys and even humans are mammals. Exhibited here is a living fossil, the Duck-billed platypus, one of the most important and interesting evidences of animal evolution. Though platypus is classified as a mammal, it has some characteristics of birds as well as reptiles. The evolutionary chart of mammals explains the origin, development and classification of different kinds of mammals. In the next two exhibits are displayed mounted specimens of some small and large mammals found in India.

In the last section of the gallery, there are dioramas depicting tiger and leopard in their natural habitats. Another exhibit displays some of the extinct and endangered mammals of India.

Human-made crisis

The Gallery I ends with a thematic exhibit the Human-made crisis. It emphasizes the problems of depletion of wildlife due to human interference while highlighting the preventive measures required to be taken for protection of wildlife which is an essential and integral component of nature for maintaining its ecological balance.



A tiger habitat



Endangered animals

GALLERY II: NATURE'S NETWORK – ECOLOGY

Earth is probably the only planet in our solar system which sustains life. Life on Earth is possible primarily because of its unique atmosphere. The atmosphere contains all the life-sustaining elements and is confined to a very thin layer around the Earth's surface known as biosphere. From microorganisms to giant plants and animals, the Earth is home to over a million kinds of different life forms.

Earth is a rich repository of both living and non-living elements. The interaction of living and non-living elements of nature makes Earth functionally viable. Thus, nature is an intricately woven network of living things that besides interacting among themselves interact with their physical environment for fulfilling their various needs. The study of this interaction is dealt in a special branch of science called 'Ecology'. The Gallery II on Nature's Network - Ecology highlights some of the basic principles of ecology, drawing up examples from various ecological processes of nature. This basic exposure to the delicate network of nature is intended to create awareness on various critical environmental issues facing humanity today.

Ecosystems of the world

In the first section of this Gallery, one comes across six vivacious panoramas of major life-supporting zones of the world, the biomes. Vista after vista, the nature's treasure and glory unveils itself as one move from

one exhibit to another. A self-operated synchronized commentary in Hindi and English also helps visitor for better understanding of the exhibit.

An ecosystem is a special environment determined by factors like soil, rainfall, temperature, air, altitude, latitude and source of energy. The plants and animals of an ecosystem have unique adaptations acquired in response to the characteristic environmental condition prevailing in the ecosystems. Seven major biomes of the world are shown in this section:

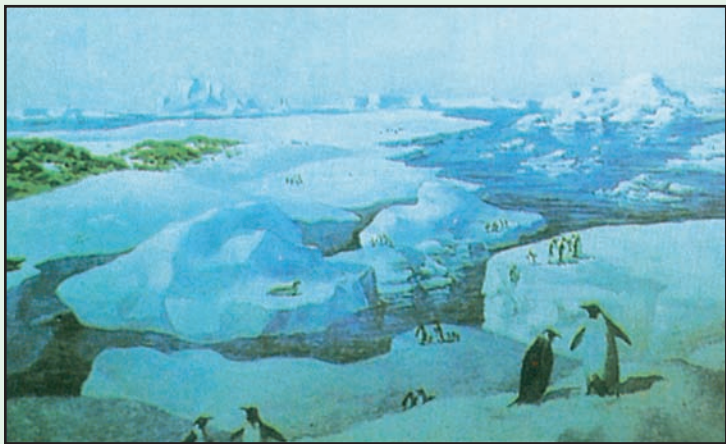


A view of coral colony with distinct life associated with it

Oceans

Ocean forms the biggest ecosystem of the world covering over 71% of the Earth's surface. It not only harbours rich and diverse variety of life but also contributes and influences the climatic conditions on land to affect the terrestrial life as well. From minute phytoplanktons and zooplanktons to large animals

like shark, to the biggest mammal- the whales, ocean is the home to a large number plants and animals. A variety of fishes, sponges, corals, shelled animals, star fishes, sea snakes, seals, walrus, dolphins and many more astonishing creatures live at varying depths in the sea. Among the aquatic ecosystems, the most complex ecosystem is represented by the coral reefs. Corals are tiny animals related to the group of jelly fishes. Despite their plant like appearance coral animals consist of a soft body and develop a limestone casing around them as they mature. This results in the formation of large colonies of coral reef in



Polar region — Antarctica

oceans of tropical region. Coral reefs form the home to a highly rich variety of marine life. They also help keep current of oceanic waves under check, restricting them to wash down the coastal regions frequently.

Grasslands

Grasslands constitute nearly a quarter of the total land surface. They are the regions where grasses form the dominant life. Depending on the climate and soil type, the vegetation of grasslands may vary from one

part of the world to another. The grasslands are classified into two broad groups: grasslands of temperate regions and grasslands of tropical regions. *Prairie* of North America, *Pampas* of South America and *Steppes* of Eurasia are the examples of temperate grasslands, while *Savannah* of Africa is an example of tropical grassland. The exhibit depicts a landscape from the Savannahs. Being on the equator, the climate of this grassland is hot with very little seasonal variation in temperature. Rainfall exceeds 100 cm a year. The vegetation of savannahs is comprised of mainly tall grasses with short trees, shrubs and herbs. Savannahs are also rich in fauna and include antelopes, impala, zebra, giraffe, gnu, cheetah, lion, hyena and a wide variety of birds and reptiles.

Deserts

The Deserts are the sand-covered regions of the world with scanty precipitation. The scarcity of rainfall gives all the major characteristics to the desert regions, the typical sparsely distributed vegetation and rich but hidden animal life. The major deserts of the world are *Sahara* of North America, the *great Australian desert*, the *Arizona* of South America, the *Arabian Desert* and the *Thar* desert of India. Despite the harsh climatic conditions, deserts are the home to an amazingly rich variety of plants and animals adapted to extreme heat and drought. The exhibit projects a landscape of Arizona desert with scattered patches of vegetation, comprised of saguaro, cactus, shrubs, small cacti and animals like foxes, rabbits, kangaroo rats, insects, lizards and birds.

Tropical rain forests

Once stretched over a wide tropical zone of Earth, the tropical rain forests now remain confined to some isolated pockets of the world. These forests are found

in the regions where temperature and rainfall are not the limiting factors. In India, these forests are found in Kerala, Arunachal Pradesh and Andaman and Nicobar Islands. Tropical rain forests are comprised of very dense multistoried trees, shrubs, lianas and ground vegetation forming many stories and making the entire ecosystem impenetrable. The forests remain green throughout the year. These forests are a rich repository of biological diversity with abundant varieties of plants and animals. The animal life includes varieties of insects, amphibians, reptiles, birds and mammals.

Coniferous forests

Coniferous forests are found on high altitude of mountainous regions with cool summer and severe winters. The vegetation is mainly comprised of tall evergreen trees bearing narrow needle - like leaves such as spruce, firs and pines. These forests grow at an altitude of about 1500 to 3500 meters above the sea level. Animal life consists of deer, bear, moose, lynxes, wolves and a wide variety of primates and birds. Coniferous forests play vital role in checking the flow of water down-stream and preventing landslides and soil erosion.

Polar Regions

The North and the South poles of the Earth are the Arctic and Antarctic regions respectively. These are permanently ice-covered regions with scanty vegetation and animal life. The only vegetation found here are the floating phytoplanktons. Animal life is limited to shrimps, penguins and seals in Antarctica. The polar bear is found in the Arctic regions. The exhibit depicts an Antarctic landscape seen from

‘*Dakshin Gangotri*’, the base camp of India established during the first Indian expedition to the South Pole.

Energy for Life

After the breath-taking journey through major ecosystems of the world, one comes across a series of exhibits explaining the flow of energy in an ecosystem. Energy is the basic requirement of any system to remain operational, whether it is mechanical or biological. Everything that works needs energy.



A complex food chain

However, in the process energy changes its form. Things work only when they have a source of energy to power their movement. A wind-mill, a water-wheel or an electric bulb all are the examples of change of one form of energy into another. A wind-mill works with the energy supplied by the wind current (flowing air). The working of a wind-mill produces electricity which is either stored or used for other mechanical or electrical gadgets to work. The wind currents are caused by the geo-climatic changes taking place in the earth's atmosphere due to differences in temperature of pressure with the rotation of the globe. The changes

are further caused by the energy supplied by the solar radiations. Like-wise, the water-wheel is run by flow of water running through rivers due to gravitational force of earth. The rotation of water-wheel generates electricity. Water in rivers comes from melting of snow on the high altitudes of mountainous regions. Snow melts because of the heat supplied by Sun. Similarly,



An exhibit depicting water cycle

an automobile is set into motion by using the stored energy of fossil fuels. Fossil fuels are the organic remains of the plant and animal life that thrived on the Earth millions of years ago. A part of the biomass that got compressed into the Earth crust, transformed into fossil fuels - coal, oil and gas, through biological,

chemical or physical processes. Thus, the energy we get today from these fuels is actually the solar energy that remained trapped in the plants and animals over millions of years ago.

Mechanical things are made operational by using different sources of energy. But where from does the energy for the living beings come? And what mechanism is involved in transforming the solar energy into usable form of energy by the living beings? These questions are dealt in the next section of the Gallery on the biological factory of Earth.

Leaf - the biggest factory on Earth

A huge walk-in-through model of leaf takes visitor to the base camp of the largest biochemical factory operational within the leaves of green plants. Green plants collectively produce over one trillion tons of carbon compounds every year through a process called photosynthesis. An insight into the anatomy of the leaf gives the functional relevance to the whole process of photosynthesis. A layer of elongated palisade cells and the loosely arranged rounded spongy cells below them contain chloroplasts which are the main sites of photosynthesis in the leaves. The chloroplasts are the elongated cellular organelles found only in green plant cells. Chloroplasts contain the green pigment - *chlorophyll*. This pigment is used in trapping the solar radiations and activating a cyclic chemical reaction inside the leaf. The trapped solar energy is fixed into carbohydrate molecules utilizing atmospheric CO_2 and water as the raw material. Oxygen is also released during the process. The energy stocked in the bonds of synthesized

carbohydrates is not only used by plants but also by the animals. Green plants provide the main thrust in making an ecosystem operational.

Food chain

Energy synthesized by plants does not remain locked in them for long and a part of it passes to the organisms feeding on plants. The group of such plant-dependent animals is called herbivores. Another group of animals that derive energy by feeding on herbivores is called carnivores. This way the energy flows in a definite pattern through various levels of a chain called food chain.

Food chain may be simple or complex depending on the number of carnivorous links it possesses. In the depicted simple food chain is shown a producer (a plant), a herbivore (a squirrel) and a carnivore (a kestrel bird). However, a complex food chain may have many carnivorous links of second, third and fourth order. The projected complex food chain involves four carnivorous links:

Plant → Butterfly → Toad → Snake → Eagle → Leopard
(P) (H) (C₁) (C₂) (C₃) (C₄)

Food web

In nature the food relationships are not so simple. An ecosystem may have several intricately linked up food chains where many organisms occupy different positions in different food chains due to their diverse food habits. Man and other organisms for example are herbivores as well as carnivores at the same time. So, the relationships between the organisms are not always in the form of a simple food chain like fashion, but form a complicated food network termed as Food web.

Food Pyramids

For analyzing the productivity and economy of nature several methods have been employed. Among them one is the diagrammatic representation through ecological pyramids. Ecological pyramids account for the relationship that exists between the number, biomass and energy contents of the producers, herbivores and carnivores of different order.

A food pyramid in which plants and animals are grouped into different levels on the basis of their



Scavengers feeding on carcasses

feeding habits, is displayed in the gallery. Each level is called a trophic level. Plants being the producer occupy the base and the first trophic level of the pyramid. Herbivores form the second trophic level, and carnivores of different orders occupy the third, fourth and fifth trophic levels. In a food pyramid, the number of organisms at each level decreases with every higher trophic level and so the pyramid formed is upright in nature, representing a structural stability.

Scavengers

There is nothing called waste for the nature as far as biological things are concerned. Even the energy which remains stocked in dead bodies (carcasses) has been utilized by a group of animals called scavengers. In fact, scavengers may be said to be the clean-up crew of the nature, performing a very useful and important function of cleaning up the environment. Scavengers include crows, vultures, hyenas, jackals etc.

Decomposition

Plants and animals that die must decompose to ensure the release of stocked-in raw materials back to



Man the destroyer—a symbolic exhibit

nature. Decomposition is a natural process of breaking down complex organic molecules into simple ones which could be reused again. The organisms associated with this important function are called the decomposers. Although earthworms, millipedes, termites, ants and insect's larvae feed on dead organic matter, they are not decomposers as they consume rather than break

down the dead organic matter for building up their own bodies. In fact certain bacteria and fungi are true decomposers acting on the dead organic matter to break it down into simpler molecules.

Bio-geochemical Cycles

An ecosystem is a function of biotic and abiotic components. Energy and raw materials such as water, minerals, salts and gases are the abiotic components of the ecosystem. Living organisms continuously interact with the abiotic components to get energy and raw materials from their environment. With the flow of energy through various levels of an ecosystem, raw materials also pass from one organism to another and return to nature after death and decay of the organisms. While the energy flow is a one-way passage the supply of raw materials is a cyclic process, involving living organisms on one hand and their physical environment - soil and atmosphere on the other. Thus raw materials including water continuously keep on cycling. This cycling of raw materials through biological forms (bio-) and nature (physical environment or geo-) is called bio-geochemical cycling. This cycling is continuously going on through ages. Shown here are some important bio-geochemical cycles operational in the ecosystems.

Inter-relationship

The interdependence of plants and animals has been highlighted in the exhibits on inter-relationship, depicting different kinds of interactions among the organisms of a community. Inter-relationship is the relation that exists between two species of a community, not always for food but for other requirements as well like habitat, feeding, shelter etc. When two species live in close association for a long time the

association is called as *Symbiosis* (living together). In all such associations at least one of the species is benefitted from the relationship. *Mutualism* is a kind of symbiotic relationship, in which both the partners are benefitted. The association of insect-flower and alga-fungi are common examples of mutualism. Insects get nectar and honey from the flower and in the process help plants in pollination of flowers. The association of an alga and a fungus form a new plant called lichen. In this association the food produced by alga is used up by the fungus partner, which in turn provides alga the raw materials from the surroundings. In some associations, only one partner gets benefitted while the other remains unaffected. Such association is called *Commensalism*. Sea anemone attaches itself to the shell of hermit crab. The crab is although not affected, but its movement helps anemone to get the food easily. In another type of association one partner is benefitted at the expense of other. *Predation* and *parasitism* are such types of associations. In parasitism one partner is usually smaller and lives inside or on the body of the other - the Liver fluke infesting inside the body of a cattle or a *Cuscuta* plant harbouring on trees. In predator ship, the predator is usually larger and destroys the smaller prey - a carnivore preying on an herbivore in a food chain. Thus all the organisms of a community are interacting and maintaining a close association with the others to fulfill their requirements. Such associations are critical for working of the nature and also for the maintenance of a balanced ecosystem.

Human beings and Nature

Nature has existed without human beings for billions of years. But can human beings survive without nature?

Surely not, as the separate existence of human beings from nature is as much impossible as life without water or air. Nature is the source for all his needs – food, clothing, shelter and sustenance. The dependence of human beings on nature has been highlighted through a large dramatic diorama capturing a village scene from Haryana. On view are the countless ways in which villagers utilizes natural resources for building houses and hutments, domesticating animals for milk, meat, leather and for security, obtaining raw materials for making useful objects using natural resources in different ways, cultivating crops for obtaining food



Children at the Discovery Room

and for deriving energy etc. However, in turn how nature is affected by human activities are no hidden realities anymore.

Impact of human beings on Nature

Life existed on Earth for about 3500 million years. Primitive human beings arrived on the scene quite late, perhaps only a couple of million years ago. Modern human beings *Homo sapiens* emerged and established

as a dominant species only about forty thousand years ago. The human existence as a farmer and a settler began just about ten thousand years ago. In this short period of time, which relatively stands only fraction of seconds on the evolutionary time scale, human beings have inflicted considerable damage to the rest of the living world.

In this short period human beings became a dominant species mastering the world today. His/ her incredible feats are awe-inspiring. To begin with, from making tools to discovering fire, wheel, farming, harnessing energy and mastering over the speed were some of his achievements in his endless pursuit to make life more luxurious and comfortable. The other side of the coin, however, reflects a most horrifying picture. The march of human beings toward progress has dented nature in several ways. Deforestation, destruction of wildlife, widespread pollution are some of the horrifying realities of the sufferings of the nature. In the last few decades alone more damage has been done to the environment than in all the previous years of human beings' existence. Where could all this lead to?

Human being today is precariously perched to the very same branch he/ she is axing i.e. damaging the nature that sustains his/her own survival, without a forethought for the future. Today's concerns for environmental conservation are depicted through dramatic exhibits bringing to light how some of the environmentally destructive activities of human beings affect the delicate balance of nature.

Four pillars of conservation

We talk much about environmental conservation these days. What does it actually mean? Is saving

wildlife alone the solution or something more? In fact, it is far more, a matter of our own survival with a friendly coexistence with other creatures and with nature as a whole. The reasons for conservation (ethical, aesthetic, scientific and economic) which are essential for the survival humankind are depicted here as pillars.

Ethical: The choice of destruction or preservation of different life forms is in our hands. It is our moral duty to hold the planet in trust and preserve it so that what past had passed on to us could be passed on to the succeeding generations. Natural heritage is meant to be passed on and should be preserved.

Aesthetic: Earth is vivacious, colourful and beautiful due to its diversity of life. Without life it wouldn't have been as vibrant and lively as it is now. It is always a pleasure to watch such natural beauty and diversity around us. It should have to be preserved to entertain the man for long.

Scientific: Human being is also bound in an intricate network that exists between all the living organisms. Nature holds many mysteries that still need to be explored. It is a treasure house of scientific knowledge. Its wildlife is a raw material for scientific work and it is unwise to destroy it thoughtlessly.

Economic: Wildlife is a natural resource that supplies raw materials and food. Exploitation of wildlife should be restrained so that breeding stock may not become endangered. A major source of tourist attraction, wildlife has immense value for mankind.

GALLERY III: CONSERVATION

The Gallery III presents an overview of the environmental degradation caused by human activities and the need for its protection and conservation.

The introductory diorama on Forest Ecosystem presents two contrasting scenes. One scene depicts a balanced ecosystem with rich flora and fauna. The other one depicts a devastated and degraded land caused by deforestation left for soil erosion and barrenness. One can also listen to the voices of birds and animals while watching the exhibit.

An impact exhibit of a human hand pulling out a tree symbolically represents our lack of understanding of the natural system. This has resulted in ruthless exploitation of nature and natural resources. A series of exhibits highlight the role of trees in the formation and preservation of top fertile soil, and also explain how trees help soil in absorbing and retaining water.

Next, visitor comes across the exhibit depicting environmental impact of human action in the form of deforestation. The loss of tree cover result in soil erosion, landslides, floods, siltation of river beds and dams etc. bringing in adverse changes in climate and water cycle.

Our rural population still depends largely on the conventional energy resources like wood. The

importance of non-conventional energy resources for rural areas and to avoid over exploitation of forest resources has been projected in the next exhibit. The action plan needed for afforestation and regeneration of wastelands with people's participation and governmental efforts are also highlighted in this section of the Gallery.



A scene of deforestation

Wildlife conservation

One of the worst sufferers of deforestation and over-exploitation of nature has been the wild life. Many species of animals and plants have already disappeared and several others are on the verge of extinction. Asiatic Lion, which once reigned over vast forests of northern and eastern India, are now confined to small pockets of Gir Forests in Gujarat.



Two faces of forest : A forested land and a denuded land



Formation of top soil and role of roots in holding it together



A view of Chipko movement

Similarly, the Tiger which once reached on the verge of extinction is now being protected in 27 National Parks and Sanctuaries under ‘Project Tiger’. Project Tiger was launched in 1973 to protect the alarmingly declining population of tiger in India. The project ensured protection to the entire ecosystem of tiger habitat by providing protection to the tiger. The success story of Project Tiger paved the way for many other similar projects for wildlife protection. Some such major projects are Project Elephant, Project Hangul, Project Rhino, Project Red Panda, Project Crocodile etc. The exhibit ‘Success Story’ emphasizes the need for public cooperation and governmental efforts for saving the endangered wildlife which has reached on the verge of extinction.

The next exhibit on “shrinking tropical rainforests” depicts the significance of the rain forests for human life. Tropical rain forests are very important for preserving the environment. These forests are characterized by having distinctly large varieties of plant and animal life. Their destruction is not only causing disappearance of large chunks of forested land but also decimating the rich genetic and biological diversity. These forests once existed over a wide belt of land along equator, but have now remained confined in some isolated pockets along equator.

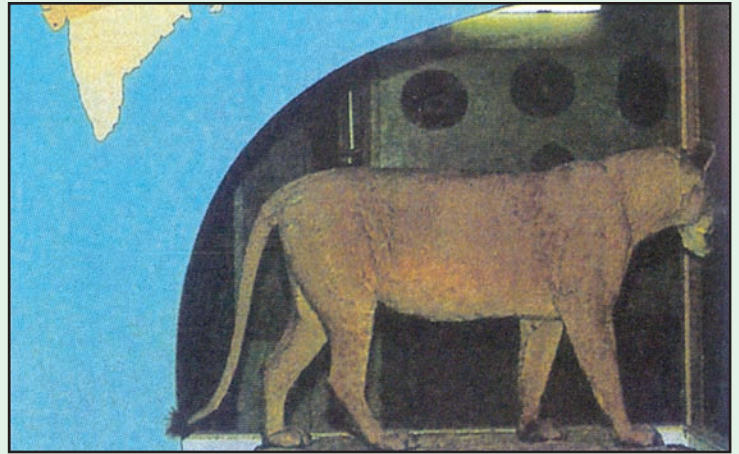
Conservation: our tradition and culture

India has a long tradition of love, respect and reverence for the nature. This has been displayed vividly in various forms of art and culture.

On the view are the two exhibits: one depicting the Bishnoi tradition of nature conservation, and the other one, the world famous Chipko Movement. Both these movements became landmarks in the conservation history of India. They are symbolic to the conservation ethos enshrined in the Indian society. Whereas the Bishnoi tradition popular in Rajasthan treats every living and non-living component of nature as sacred, the Chipko movement helped save thousands of trees from being cut down due to timely and conscious intervention of the people of Gopeshwar village in Pauri Garhwal of Uttarakhand State.

Problems of air and water pollution

Air and water pollution has become a major environmental hazard in the country. Increased concentration of poisonous gases and particulate matter in the atmosphere adversely affect the organisms. Air pollution is a major cause of other environmental problems like acid rain, ozone depletion and green house effect. Some insects are the natural enemies of many pests responsible for destroying our valuable crops. They are in fact friends of humanity. The increasing use of pesticides not only destroys the targeted pests but their natural



The endangered Asiatic Lion



Bishnois living in close harmony with nature



An animal Quiz at the Discovery Room



enemies as well, thereby adversely affecting other living organisms and important food chains. Water pollution is another health hazard inflicted by industrial effluents and community wastes. These pollutants play a major role in polluting the water resources as depicted in the exhibit.

Ganga Action Plan

The River Ganga is the cradle of Indian Civilization. It is a symbol of purity and sacredness since time immemorial. However, it is one of the most polluted rivers in the world today. Originating from the Gangotri in the Himalayas, the River gets polluted in different ways as it descends onto the plains in the course of 2525 Kms of journey through 25 cities, before it finally merges into the Bay of Bengal.

The Ganga Action Plan (GAP), an ambitious Project of Government of India, was launched in 1982 to clean and protect River Ganga. The Plan included preventing the flow of untreated waste into the river, installing adequate sewage treatment plants, afforestation on the river banks and creating public awareness. Encouraged by the success of GAP, a new project of River Action Plan has been envisaged by Govt. of India to clean up all the major rivers of India.

Energy conservation

The natural non-renewable energy reserves are drying up fast due to increasing demands of growing human population. Reserves of coal, natural gas and petroleum are not going to last for long. Large scale deforestation has badly affected the biomass which is also a cheap source of energy for rural population. The exhibit on alternate sources of energy depicts the significance of renewable energy resources for future human needs.

The Gallery III ends with an exhibit depicting different ways in which every individual can contribute in the mission of Nature Conservation.

NMNH INITIATIVES IN ‘BIODIVERSITY’

With an objective of environmental education, the various Museums of the National Museum of Natural History (NMNH) located in New Delhi, Mysore, Bhopal, Bhubaneswar, Sawai Madhopur and Gangtok (forthcoming), have undertaken several initiatives on “Biodiversity”, which has become a subject of international discussion.

There are permanent Galleries on ‘Biodiversity’ in Mysore and on ‘Introduction to Natural History’ in New Delhi. In addition, the Museums under the NMNH have organized several exhibitions on Biodiversity, whether temporary, travelling or mobile. These included themes such as ‘Biodiversity of Western Ghats’, “Biodiversity of Western India”, “Biodiversity of North-East”, “Forest Biodiversity”, “Plant Heritage of India” etc.

The various Museums under the NMNH have been arranging a series of educational programmes and competitions focused on ‘Biodiversity’. Some of the winning entries were utilized for publishing Table Calendars for the Museum as well. During the ‘International Year of Biodiversity’ in 2010, most of the educational and exhibition programmes were concentrated on the theme of ‘Biodiversity’. In

addition, the Museums organized many professional seminars, workshops and conferences on the intangible aspects of biodiversity (intangible natural heritage). Other programme in this direction included an ICOM-NATHIST (International Council of Museum’s Committee on Museums and Collections of Natural History) Conference on ‘Museums and Intangible Natural Heritage’ in 2007 in Calicut, a workshop on ‘*Hortus Malabaricus*’ in 2008 in Kochi, a national level Poster design competition as part of the ‘Darwin200-India’ of UNESCO in 2009, as well as an exhibition on “Plant explorations of Colombia” in 2010 in New Delhi.

The NMNH is also involved in a series of “Festivals of Museums, Biodiversity and Intangible Natural Heritage” with focus on the Role of Museums for the Preservation of Indian inscriptions on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity.

The NMNH was involved in organising an exhibition on Biodiversity as part of the launch of the United Nations Decade on Biodiversity for Asia and Pacific organized by the Ministry of Environment & Forests, Government of India on 23rd May 2011.

NMNH INITIATIVES IN MUSEUM ACCESSIBILITY

The various Museums of the National Museum of Natural History (NMNH) located in New Delhi, Mysore, Bhopal, Bhubaneswar, Sawai Madhopur and Gangtok (forthcoming), have objective of environmental education by accessible educational programmes and exhibitions aiming at social inclusion. Accordingly, Persons with disabilities constitute one of the special audiences of the NMNH.

The NMNH is the first Museum in Asia to produce Museum publications in Braille in the eighties. All the Regional Museums under the NMNH have disable-friendly physical infrastructure which makes these Museums accessible to all including Persons with disabilities. A special garden called “Touch, Feel and Learn Live Plant Bio-resource Centre” or ‘Sensory Garden,’ established in RMNH Mysore has become a model for many Museums to work in this direction.

All the Museums under the NMNH also organize various programmes catering to the special needs of children with various impairments related to hearing/speech, vision, mental and mobility. The National Museum of Natural History also has a few publications produced in Braille for the benefit of Visitors with visual impairment.

One of the unique programmes in which the NMNH excel is the organization of Special Nature Camps for children with disabilities. In addition to the various programmes and activities, the NMNH also extends professional workshops in the field of Museum Accessibility to various parts of the country. In 2011, the NMNH also hosted the first National Seminar on “Museums and Visitors with disabilities” in Bhubaneswar for the Museums Association of India. An Exhibition on **NMNH Initiatives in Museum Accessibility** was also put on display in the conference, highlighting the various programmes undertaken by Museums under NMNH.

The NMNH has released various Declarations on Museums and Disability (Mysore, Chennai and Bhubaneswar) for the benefit of Museums professionals.

As part of the various programmes related to the global launch of the World Environment Day in 2011 by the UNEP in India, the NMNH organised a Special Nature Camp for Children with Speech/Hearing impairments in Bannerghata National Park in Bangalore.

ADMISSION: FREE

MUSEUM DAYS & HOURS

Tuesday To Sunday

10.00 A.M. to 5.00 P.M.

Museum Closed- Monday and some selected Gazetted Holidays.

Museum has the following Regional Centres:

- **Regional Museum of Natural History**, Siddarth Nagar,
Mysore-527001
Ph.: (0821) 2446453
- **Regional Museum of Natural History**, E-5 EPCO Campus,
Arera Colony, Bhopal- 462016
Ph.: (0755) 2420429
- **Regional Museum of Natural History**, Acharya Nagar,
P.O. R.R.L., Bhubaneshwar-751013
Ph.: (0674) 2584114
- **Rajiv Gandhi Regional Museum of Natural History**
Sawai Madhopur - 322001
Ph.: (07462) 233310

For further information please contact on:

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Telefax: 23314932, Website: www.nmnh.nic.in



सत्यमेव जयते

National Museum of Natural History

(Ministry of Environment and Forests)

FICCI Museum Building, Tansen Marg,

New Delhi-110001



'Visit NMNH where learning can be fun'