TREASURES

OF THE NATURAL WORLD







ABOUT

ArtScience Museum is dedicated to the exploration of the interconnection between art, science, technology and culture and their roles in shaping the society. As a study of the creative processes that underlie the human experience, ArtScience Museum seeks to understand what drives creative people, how they acquire their skills and how they work. Using a combination of intriguing content and intellectual discussion in the exhibitions and programmes, these stories serve to inspire creativity in all of us.

This Educator's Resource is intended to act as a guide before, during and after your visit to ArtScience Museum. Through content-based activities, we hope to enhance the positive effects of out-of-classroom learning prior to your visit and scaffold students' museum experience during post-visit activities. This resource aims to help you and your students have a more fulfilling visit by anticipating the main themes and concepts in the exhibition. Although this resource is aimed at all levels, you might look into adjusting the questions and activities to cater to your students' level of understanding. Suggested activities are meant to be used as references and are not mandatory to complete before your visit.

THE EXHIBITION

Treasures of the Natural World is a highly anticipated exhibition which brings the awe and wonder of Natural History Museum, London to Singapore. Visitors will embark on an epic voyage through the history of natural world and discover how these treasures have helped and still is helping us unravel the mysteries of the past.

The 200 treasured objects showcased in the exhibition had been meticulously hand-picked from the Natural History Museum's extensive 80 million artefacts and specimens. These treasures not only include zoological, botanical, geological specimens, there are also journals, books and artefacts which belonged to some of the world's greatest scientists including Alfred Russel Wallace and Charles Darwin.

There are five main sections in the exhibition:

- 1. Building Nature's Treasure House
- 2. Treasures of the Mind
- 3. Treasures of Exploration
- 4. Treasures of Life are Everywhere
- 5. A Museum for a Modern World

Exploring through these sections will trace the trail of how revolutionary ideas and our perceptions of the natural world had been moulded through bold and adventurous voyages carried out by some great minds of the past. *Treasures of the Natural World* showcases a wealth of objects which provides important insight into the biggest questions and issues our planet and species face in the future.

BEFORE YOUR VISIT

Natural History Museums are places where current and historical specimens and artefacts of the natural world are recorded. These treasures are irreplaceable and extensive records of life on Earth. They play a pivotal role in helping us understand the past, present and future of our natural world.

Students can brainstorm and share why they think it is important to amass and maintain all these treasures of the natural world. What does the natural world mean to them? What is natural and what is not? What do students think the role of natural history is? How will it affect us if we choose to ignore the natural world?

HANDS-ONGOING ACTIVITY

Curiosity is the one thing invincible in Nature. Prompt and guide students to begin their own collection of specimens from the natural world. It may be items that interest them on their nature expeditions. Encourage them to have a continual interest to gather, label and keep the specimens well.

Remind them to be a responsible nature collector - only take specimens such as leaves, flowers, pebbles, feathers or empty birds' eggs, that are, broken or already fallen to the ground, and always leave enough behind to become animals' food or home! Collecting specimens from nature reserve, parkland or national park usually requires a permit from local authority.

In Singapore, permits application can be applied at https://biome.nparks.gov.sg/.

CURRICULUM LINKS

PRESCHOOL

Source: Ministry of Education Singapore Subject Syllabuses

AESTHETICS AND CREATIVE EXPRESSION

- Become sensitive to the visual environment and to art works
- Express their personal views of the world around them

DISCOVERY OF THE WORLD

- Sustain and extend curiosity
- Discover things for themselves
- Build on what existing knowledge and understanding
- Come up with their own solutions and reasons for explanations
- Cultivate a sense of care and appreciation of the environment

		Sectio	n 0: Introd	uction		Secti	on 1: Buildi	ing Nature'	s Treasure I	House		Secti	on 2: Treas	ures of the	Mind	
Artefacts	Dirosaur Claw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hars Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Ower's Echidna Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton
Themes/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Aesthetics and Creative Expression						1		✓	✓	√						
Discovery of the World	√	1	√	√	√	✓	√	√	√	√	√	√	√	√	1	√

	5	Section 3: T	reasures of	Exploratio	n		Secti	on 4: Treas	ures of Life	are Everyv	/here		Section 5	: A Museun	n for a Mod	ern World
Artefacts	Sketch of the Kamala Plant	Antarctic Fossil Wood	Plant Fossil	Emperor Penguin Chick Skin	HMS Challenger Slide Box	Insect Collecting Kit	Claudina Butterflies	Reindeer Beetle	Silver Chafer Beetle	Sabre-toothed Cat	Tiger	Dodo model	Jadarite	Chrysoberyl, variety Alexandrite	Martian Meteorite	Morpho Butterflies
Themes/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Aesthetics and Creative Expression	>												1	1		1
Discovery of the World	√	√	√	√	✓	✓	√	√	√	√	√	√	√	✓	√	√

PRIMARY

Source: Ministry of Education Singapore Subject Syllabuses

SCIENCE

- Provide students with experiences which build on their interest in and stimulate their curiosity about their environment
- Provide students with opportunities to develop skills, habits of mind and attitudes necessary for scientific inquiry
- Prepare students towards using scientific knowledge and methods in making personal decisions
- Help students appreciate how science influences people and the environment

ART

- Develop an interest in looking at and creating art
- Understand and value art from a variety of cultures and context
- Gather information from visuals and what they see
- Make informed links between the use of visual qualities and intentions of the artist
- Generate ideas from observing visuals and the world around them
- Cultivate a spirit of innovation and experimentation

SOCIAL STUDIES

- Develop the ability to understand the relationship between people and the environment over time and space
- Develop ability to describe the achievements of societies past and present and how they contribute to the progress of humanity
- Develop the ability to explore ideas and consider their relevance
- Develop the curiosity to learn more about the world they live in
- Learn to make careful observations
- Learn to process information/data based on reliability and relevance
- Learn to reflect and make informed decisions based on information
- Learn to recognise that beliefs shape one's thinking
- Learn to consider the ethical effects of one's actions and the impact on others so as to make informed
- Develop the ability to make decisions and carry out appropriate actions
- Learn to care for the community and the environment

		Sectio	n 0: Introd	uction		Secti	on 1: Build	ing Nature'	s Treasure I	House		Secti	on 2: Treas	ures of the	Mind	
Artefacts	Dirosaur Claw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hars Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Owen's Echidna Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton
Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Science	✓	✓	✓	√	√	✓	√	√	√	√	✓	✓	✓	✓	✓	✓
Art						✓		√	√	√					√	
Social Studies						√	√	√	√	√	√	√	√	√		√

		Section 3: T	reasures of	Exploratio	n		Secti	ion 4: Treas	ures of Life	are Everyv	/here		Section 5	: A Museun	n for a Mod	ern World
Artefacts	Sketch of the Kamala Plant	Antarctic Fossil Wood	Plant Fossil	Emperor Penguin Chick Skin	HMS Challenger Slide Box	Insect Collecting Kit	Claudina Butterflies	Reindeer Beetle	Silver Chafer Beetle	Sabre-toothed Cat	Tiger	Dodo model	Jadarite	Chrysoberyl, variety Alexandrite	Martian Meteorite	Morpho Butterflies
Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Science	√	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Art	√												√	√		✓
Social Studies	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

SECONDARY

Source: Ministry of Education Singapore Subject Syllabuses

SCIENCE/COMBINED SCIENCES

- To understand the place of humanity in the natural world
- To understand the importance for man to understand and maintain the connections with living things and his environment
- To show care and concern for people and the environment
- Learn to relate to issues in their everyday experiences, and to the commonly observed phenomena in nature
- To appreciate the links between different themes/topics and thus allow the integration of scientific ideas
- To explore and understand the physical and natural world
- To deepen the understanding of what Science is and how it is practiced and applied
- To become aware of the impact of science and on society, industry, and business
- To develop, implement and communicate new ideas to others in diverse environments

SOCIAL STUDIES

- Develop curiosity to learn more about the world they live in and make careful observations
- Learn to appreciate the interdependent relationship between people and the environment
- Learn to gather and organise information
- Learn to make observations using sources and interpret data

ART

- The role of art in society and the statements artists make about the world and themselves
- Address key ideas and issues that people throughout history are concerned with
- Make informed links between the use of visual qualities and intentions of the artist
- Hone their observation skills and learn to discriminate visual qualities
- Identity various elements of art e.g. visual characteristics like Dot, Line, Shape, Form, Colour, Texture, Space, Tone
- Develop a deeper understanding in the use of art elements and principles as tools for visual communication
- Exposure to different art forms, visual representations, variety of media and art techniques
- Convey experiences and ideas with images

DESIGN AND TECHNOLOGY

- Develop an awareness of design in the made-world
- Develop an appreciation of function, aesthetics and technology in design
- Exercise judgements for design appropriateness with respect to the users, functionality and the environment

GEOGRAPHY

- Acquire knowledge of the characteristics, distribution and processes of physical and human phenomena
- To develop a concern for the environment and make informed judgments about human action/behaviour
- To develop an interest in, and the valuing of, the ways that the environment supports life
- Learn the process of geographical inquiry and to use it to make sense of new knowledge
- Develop skills in acquiring, communicating and applying geographical knowledge
- Interpret maps, atlases, tables, graphs, photographs and fieldwork data
- Develop a concern for the environment and make informed judgments about human action/behaviour

HISTORY

- To develop an interest in the past and the forces that shaped human activities, institutions and ideas over time
- Have the ability to analyse and evaluate the causes and consequences of historical events and situations
- Become aware of how cultural, intellectual and emotional contexts shape the thinking, value systems, decisions and actions of different peoples and groups in different times and places
- Learn to interpret and acquire information derived from various sources of information and evidence from a variety of media to support an inquiry
- Learn to draw conclusions from the study of evidence and appreciate that historical conclusions are subject to reassessment in the light of new or reinterpreted evidence
- Learn to modify and adapt their thinking according to multiple sources of information, perspectives and different circumstances, underpinned by sound moral values

ELEMENTS OF BUSINESS SKILLS

- Analytical and evaluative skills, and the ability to make judgments
- Develop initiative and enterprise

		Sectio	n 0: Introd	uction		Secti	on 1: Build	ing Nature'	s Treasure I	House		Secti	on 2: Treas	ures of the	Mind	
Artefacts	Dirosaur Claw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hars Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Ower's Echidra Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton
Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Science	√	√	√	√	✓	√	√	√	√	✓	√	√	√	√	✓	✓
Art						√		√	√	✓					✓	
Social Studies						√	√	√	√	✓	√	√	√	√	√	✓
Design & Technology								√	√							
Geography						√	√	✓	✓	✓	✓	✓	✓	√	√	✓
History						✓	√	✓	✓	✓	✓	✓	✓	√	✓	✓
Elements of Business Skills						1										

		Section 3: T	reasures of	Exploratio	n		Secti	ion 4: Treas	ures of Life	are Everyv	vhere		Section 5	: A Museun	n for a Mod	ern World
Artefacts	Sketch of the Kamala Plant	Antarctic Fossil Wood	Plant Fossil	Emperor Penguin Chick Skin	HMS Challenger Slide Box	Insect Collecting Kit	Claudina Butterflies	Reindeer Beetle	Silver Chafer Beetle	Sabre-toothed Cat	Tiger	Dodo model	Jadarite	Chrysoberyl, variety Alexandrite	Martian Meteorite	Morpho Butterflies
Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Science	√	√	√	√	✓	√	√	√	√	√	√	√	√	√	√	✓
Art	√															
Social Studies	√	√	√	√	✓	✓	√	✓	√	√	√	√	√	√	√	✓
Design & Technology																
Geography	√	√	√	√	✓	✓	√	√	√	√	√	√	√	√	√	✓
History	√	√	√	√	✓	✓	√	✓	√	√	√	√	√	√	√	✓
Elements of Business Skills																

SCHOOL OF THE ARTS

Source: Ministry of Education Singapore Subject Syllabuses

HUMANITIES AND SOCIAL SCIENCES

- Develop critical understanding and appreciation of disciplines within the Humanities and Social Sciences
- Nurture awareness of the development of humanity over time
- Develop analytical, decision-making and investigative skills for a critical understanding of the world, both past and present
- Develop respect for diverse perspectives and cultures

RESEARCH SKILLS

- Develop research skills needed for other subjects and future education
- Foster a spirit of intellectual curiosity
- Develop a desire for academic discovery
- Provide the opportunity for in-depth research into a topic of interest
- Nurture effective communication abilities
- Hone critical and creative thinking skills

SCIENCES

- Develop an appreciation for the need and value of effective collaboration and communication
- Develop scientific literacy so as to acquire and access a body of knowledge, methods and techniques that characterise science and technology
- Develop information processing and other relevant scientific skills

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Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Humanities and Social Sciences	√	✓	✓			√	√	√	1	✓	>	✓	✓	1	1	✓
Research Skills	√	1	√	√	1	√	√	√	√	√	√	√	√	√	1	√
Sciences	√	√	√	√	✓	✓	✓	✓	✓	√	√	√	✓	√	✓	✓

	9	Section 3: T	reasures of	Exploratio	n		Sect	ion 4: Treas	ures of Life	are Everyv	/here		Section 5:	: A Museun	n for a Mod	ern World
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Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Humanities and Social Sciences	>	✓	✓	1	1	>	√	√	✓	>	✓	~	~	✓	✓	~
Research Skills	~	√	√	√	√	✓	✓	√	√	√	√	√	√	√	√	√
Sciences	>	√	✓	✓	✓	✓	✓	✓	✓	✓	√	✓	√	√	✓	✓

INTERNATIONAL BACCALAUREATE (IB PRIMARY YEARS PROGRAMME)

Source: International Baccalaureate Website

WHERE WE ARE IN TIME AND PLACE

- Make inquiry into orientation in place and time.
- Learn about the discoveries and explorations
- Learn about the relationship between and the interconnectedness of individuals and civilizations, from local and global perspectives

HOW WE EXPRESS OURSELVES

- Make inquiry into the ways in which we discover and express ideas, feelings, nature, culture, beliefs and values
- Learn the ways in which we reflect on, extend and enjoy our creativity;
- Develop an appreciation of the aesthetic.

HOW THE WORLD WORKS

- Make inquiry into the natural world and its laws
- Learn about the interaction between the natural world (physical and biological) and human societies
- Develop an understanding of how humans use their understanding of scientific principles
- Develop an understanding of the impact of scientific and technological advances on society and on the environment

HOW WE ORGANISE OURSELVES

- An inquiry into the interconnectedness of human-made systems and communities
- Develop an understanding of structure and function of organisations and societal decision-making
- Learn about economic activities and their impact on humankind and the environment

SHARING THE PLANET

• An inquiry into rights and responsibilities in the struggle to share finite resources with other people and with other living things

		Sectio	n 0: Introd	uction		Secti	on 1: Build	ing Nature'	s Treasure l	House		Secti	ion 2: Treas	ures of the	Mind	
Artefacts	DirosaurClaw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hars Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Owen's Echidna Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton
Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Where we are in time and place	1	1	1	1	1	1	1			1	1	1	1	1	1	✓
How we express ourselves								1	✓							
How the world works	>	1	✓		1		1			1	>	1	1	1	1	✓
How we organise ourselves				√	1											✓
Sharing the planet				√	√		√				√					√

	9	ection 3: T	reasures of	Exploratio	n		Sect	ion 4: Treas	ures of Life	are Everyv	vhere		Section 5	: A Museun	n for a Mod	ern World
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Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Where we are in time and place		√	1	1	1	>	1			1	1	1	1	✓	✓	
How we express ourselves	√					√							1	1		^
How the world works		✓	√	√	1		√	√	✓	√	√	✓			√	✓
How we organise ourselves						>	1			1	1	1				
Sharing the planet				✓			✓			✓	✓	✓				

INTERNATIONAL BACCALAUREATE (IB MIDDLE YEARS PROGRAMME)

Source: International Baccalaureate Website

INDIVIDUALS & SOCIETIES (GEOGRAPHY & HISTORY)

- Develop an understanding of the interrelationships between people, places, spaces and the environment
- Appreciate the relevance of geography in analysing contemporary issues and challenges, and develop a global perspective of diversity and change

SCIENCE

- To engage with the complexities, intricacies and beauty of science, which arouses their curiosity and heightens their learning
- To reflect on the ethical, social, economic, political, cultural and environmental implications of using science to solve specific problems and develop a personal, ethical stance on science-related issues.
- To encourage hands-on experience, inquiry, and critical thinking and to make informed and responsible decisions, not only in science but also in other areas of life.
- To appreciate the links between science and everyday life as well as the dynamic interactions between science and society.

ARTS

- Create and present art
- Develop skills specific to the discipline
- Engage in a process of creative exploration and (self-) discovery
- Make purposeful connections between investigation and practice
- Understand the relationship between art and its contexts
- Respond to and reflect on art
- Deepen their understanding of the world

		Sectio	n 0: Introd	uction		Secti	on 1: Build	ing Nature'	s Treasure I	House		Secti	on 2: Treas	ures of the	Mind	
Artefacts	Dirosaur Claw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hans Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Ower's Echidra Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton
Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30
Individuals & Societies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Science	√	√	√	√	1	√	√	√	√	√	✓	√	√	√	√	√
Arts								√	√							

	9	Section 3: T	reasures of	Exploratio	n		Secti	ion 4: Treas	ures of Life	are Everyv	/here		Section 5	: A Museun	n for a Mod	ern World
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Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40
Individuals & Societies	√	√	√	√	✓	✓	√	✓	✓	√	√	✓	√	√	√	✓
Science	√	√	√	1	√	✓	√	√	√	√	√	√	√	√	√	✓
Arts	√												√	√		✓

JUNIOR COLLEGE/PRE-UNIVERSITY

Source: Ministry of Education Singapore Subject Syllabuses

GENERAL PAPER

- Understand better the world in which they live by fostering a critical awareness of continuity and change in the human experience.
- Appreciate the interrelationship of ideas across disciplines.
- Broaden their global outlook while enabling them to remain mindful of shared historical, social and cultural experiences.

KNOWLEDGE & INQUIRY

- Develop an understanding of the nature of knowledge
- Develop an understanding of the ways of constructing knowledge in the different fields
- Develop critical thinking skills
- Develop an awareness of the ethical dimensions of knowledge construction
- Develop a capacity for independent learning
- Develop an ability to communicate clearly and convincingly

ART

- Cultivate deeper understanding and appreciation of visual arts within social and cultural contexts
- Encourage experimentation and innovation through exploration and creative use of materials and processes
- Increase proficiency in the use of art and design principles to communicate ideas and concepts
- Develop critical and analytical skills through research, exploration and creation of artworks
- Foster self-confidence and a sense of achievement through the practice of visual arts
- Lay the foundation for life-long interest in the visual arts

SCIENCE (PHYSICS, BIOLOGY & CHEMISTRY)

- Develop their interest in science and build the knowledge, skills and attitudes necessary for further studies in related fields
- Recognise the usefulness, and limitations, of scientific method and to appreciate its applicability in other disciplines and in everyday life
- Develop in students the understanding, skills, ethics and attitudes relevant to the Practices of Science
- Enable scientific literacy and preparedness for the challenges of the future

HISTORY

- The ability to undertake an inquiry into the past
- The ability to conduct research with guidance to select relevant sources and information to address inquiry questions
- The ability to present meaningful interpretations of the past by drawing appropriately from analysed evidence, historical contexts, and frames of reference
- The ability to recognise, analyse and evaluate the dynamics of change and continuity over time and across regions and The ability to identify, compare and evaluate multiple perspectives on a given historical issue or event
- The ability to modify and adapt their thinking according to multiple sources of information, perspectives and different circumstances
- The ability to identify and embrace connections between themselves and the larger community (past and present) and realise that their actions impact others, thus promoting a commitment to improve the world.
- Develop an understanding of social, economic, cultural and political contexts of the societies and the experiences of the peoples who lived in these societies at that point in time
- Develop an understanding of key individuals, groups, forces, events and ideas that shaped the development of the social, economic, cultural and political contexts
- Develop a sensitivity to how people's views and perspectives shape their interpretation of events, issues or developments in any specific time and space
- Develop an awareness of how cultural, intellectual and emotional contexts shape the thinking, value systems, decisions and actions of different peoples and groups in different times and places

GEOGRAPHY

- Encouraged to be inspired by the splendour of natural environments and human ingenuity
- Encouraged to care for delicate ecosystems and understand the importance of environmentally sustainable lifestyles
- Encouraged to build integrity to uphold ethical principles and be resilient in their pursuit of a better world
- Have the ability to construct understanding through inquiry using different data collection and analysis methods
- Have the ability to use and evaluate maps and other data representation to integrate information and communicate to a specific audience
- Have the ability to analyse, evaluate and reflect on information from a geographical perspective to make informed and sound decisions
- Develop an understanding of the uniqueness of different types of natural environments and places
- Develop an understanding of the evolution of landscapes and development of issues over time
- Develop an understanding of different approaches to solve real-world problems and achieve sustainable development
- Develop an understanding of the processes that shape natural environments, societies and cultures at various scales
- Develop an understanding of the interactions and interdependence among natural environments, societies and cultures at various scales
- Develop an understanding of the subjective nature of maps and using maps as a tool to persuade and analyse

		Sectio	n 0: Introd	uction		Secti	on 1: Build	ing Nature'	s Treasure I	House	Section 2: Treasures of the Mind						
Artefacts	Dirosaur Claw	Fossilised Squid-like Animal	Early Fish	Giant Grouper	Queen Alexandra's Birdwing Butterfly	Sir Hars Sloane	Fossil Tortoise Shell	Sapphire Turban Button	Alfred Waterhouse's terracotta designs	Portrait of Sir Richard Owen	Moa Feathers	Ower's Echidna Dissection	Fossil Bryozoans	Fossil Shells	Delineation of Strata of England and Wales with Part of Scotland	Pigeon Skeleton	
Subjects/Page	20	21	21	22	22	23	24	25	25	26	27	28	28	29	29	30	
Knowledge & Inquiry	√	√	√	√	✓	√	√	✓	√	√	√	√	✓	√	✓	✓	
Arts						√		√	√	√							
History						√	√	√	√	√	√	√	√	√	✓	✓	
Geography						✓	✓	✓	√	√	✓	√	√	√	√	✓	
Science	✓	✓	√	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	√	✓	✓	

	5	ection 3: T	reasures of	Exploratio	n	Section 4: Treasures of Life are Everywhere								Section 5: A Museum for a Modern World				
Artefacts	Sketch of the Kamala Plant	Antarctic Fossil Wood	Plant Fossil	Emperor Penguin Chick Skin	HMS Challenger Slide Box	Insect Collecting Kit	Claudina Butterflies	Reindeer Beetle	Silver Chafer Beetle	Sabre-toothed Cat	Tiger	Dodo model	Jadarite	Chrysoberyl, variety Alexandrite	Martian Meteorite	Morpho Butterflies		
Subjects/Page	31	32	32	33	33	34	35	35	36	36	37	37	38	39	39	40		
Knowledge & Inquiry	✓	✓	√	√	√	√	√	√	√	√	√	√	√	√	√	✓		
Arts	✓												√	✓				
History	√	√	√	√	√	✓	√	√	√	√	√	√	√	√	√	✓		
Geography	√	√	√	√	√	√	√	√	√	√	√	✓	√	√	√	✓		
Science	√	√	√	√	✓	√	√	√	√	√	√	√	√	√	√	✓		

TREASURES OF THE NATURAL WORLD

The Natural History Museum in London is home to one of the world's most important natural history collection, housing more than 80 million specimens and artefacts. This valuable collection has provided the scientific community with modern and historical specimens for their research to better understand our natural world. *Treasures of the Natural World* will highlight artefacts and specimens which tell their individual stories of adventure, curiosity and discovery.



Dinosaur claw

Baryonyx walkeri

UK

Cretaceous Period, around 120 million years old

This enormous dinosaur claw was found in a South England's quarry by an Amateur fossil hunter William Walker in 1983. Further excavation by experts from Natural History Museum unearthed more bones which led to the discovery of a new species.

Scientists deduced that this dinosaur used its claws to spear fish and rip open carcasses.

Baryonyx walker is one of Britain's most complete examples of a carnivorous dinosaur that walked on two legs.

Have a closer look

By looking at the claw alone, what methods will you use to estimate the size of this dinosaur? Other than spearing fish and ripping open carcasses, what do you think the claws may be used for?



Fossilised squid-like animal Belemnotheutis antiquus UK

Jurassic Period, around 160 million years old

The most common fossils discovered are often dinosaur bones and sea shells as only the hard parts of an animal can be fossilised. Hence, the discovery of this soft-bodied squid-like animals is incredibly rare! Instead of being scavenged at the ocean floor, this animal was buried in soft mud. Slow decomposition rates allowed mineral calcium phosphate to replace the soft parts of the body forming the fossil you see today.

Have a closer look

What do you think might have happened to this animal before and after its death? What are the distinct characteristics you notice from the fossil and how is it different to modern squid? How might these features help the animal to survive in the wild?



Early fish Eusthenopteron foordi

Canada

Devonian Period, around 370 million years old

This rare fossilised fish has helped unravel the mystery of how first creatures with backbones have evolved to live on land. The lobe fins of this animal eventually evolved into arms and legs – moving life in the waters to land.

Have a closer look

What modern animal do you think the head of this fish resembles? How do you think this fossilised fish continued to evolve?



Giant grouper Epinephelus lanceolatus Indo-Pacific region

Just over a century ago, this giant grouper was alive when oceans were much cleaner and quieter. This species is the largest reef-dwelling fish and use their enormous mouth to eat their prey whole. Today, the population of giant grouper is under severe threat due to overfishing.

Did you know?

Usually the giant grouper lives in a small group where there is only one male to several females. When the male grouper dies, the largest female undergoes a sex-change and becomes a male.



Queen Alexandra's birdwing butterfly *Ornithoptera alexandrae* Papua New Guinea

Commonly found in the forests of Papua New Guinea, the Queen Alexandra's birdwing butterfly is the largest in the world with a maximum wingspan of 30 centimetres. Although the plain brown female is bigger, the male is more flamboyant with brightly coloured wings. The distinct differences between the sexes is known as sexual dimorphism.

Have a closer look

Why do you think the male and female Queen Alexandra's birdwing butterflies look so different? Why is this species facing a rapid decline in population?

BUILDING NATURE'S TREASURE HOUSE



The formation of Natural History Museum began during the Age of Reason in the seventeenth-century Europe. In this fertile period of scientific enquiry, there was immense curiosity about the natural world which spurred many to amass and study specimens that today can still made a significant contribution to fundamental ideas about nature today.

Sir Hans Sloane was one of the most influential men during this period with a strong passion for understanding the world around him. Sloane gathered more than 400,000 natural history specimens in his private collection which formed the founding core collection of British Museum after his death in 1753.

However, the growing natural history collection soon outgrew its original home. A successful campaign headed by superintendent of the collection and eminent scientist Sir Richard Owen led to the opening of Natural History Museum in 1881 – a new and bigger home for this valuable collection.



Sir Hans Sloane (1660–1753) copy of a portrait by the artist Stephen Slaughter (1697–1765) Oil on canvas

Early to mid-eighteenth century

Apart from botanical and zoological specimens, the private collection of Sir Hans Sloane also included antiquities, books, coins and maps. His collection also consisted of exotic and highly sought-after artefacts which were found by his expert contacts from all over the world.

Did you know?

Sir Hans Sloane played an important role in encouraging people in Europe to enjoy eating chocolate. He devised the recipe of mixing cocoa with milk and sugar, which later inspired the Cadbury Brothers to sell tins of milk chocolate in the nineteenth-century.



Fossil tortoise shell Testudo sloanei Turkey

Miocene/Pliocene Periods, around 10-20 million years old

This tortoise became part of Sloane's collection through a connection in Turkey. However, it was only officially described in 1889 by naturalist Richard Lydekker. This tortoise was named *Testudo sloanei* in honour of Sloane. Currently, scientists from Natural History Museum are examining tortoise fossils in bid to find out how current threats may affect the biodiversity of modern populations.

Did you know?

Charles Darwin and Steve Irwin may have both cared for the same tortoise named Harriet. She was a Galapagos Giant Tortoise and this species is known to have a lifespan of up to 190 years!

Harriet was reportedly collected by Charles Darwin on his visit to Galapagos Islands in 1935. She was then transferred to England before being brought to her final home in Australia by John Clements Wickham, the captain of HMS Beagle.



Sapphire turban button Probably India

One of the best gemstones in Sloane's collection, the clever cut of this impressive 31.5 carats sapphire highlights its blue tone, which Sloane described as 'the finest deep colour'. It is skilfully set and oriented in a spectacular mount made of carved rock crystal, adorned with emeralds and rubies.

Have a closer look

If this precious stone was not made into a button, what would you like it to be and how would you design it differently?



Alfred Waterhouse's terracotta designs

This is the pencil drawing of a terracotta lion statue for the Museum's parapet was drawn by Architect Alfred Waterhouse in 1877. Waterhouse designed the Natural History Museum's building in a Romanesque style familiar in abbeys and churches across Europe. Under the guidance of anatomy expert Owen, the structure was designed to reflect the diversity of the natural world. Terracotta animals and plants adorned every archway both inside and out, turning the Museum into a glorious cathedral of nature, with extinct species decorating the eastern half and living species decorating the western half of the Museum.



Portrait of Sir Richard Owen (1804–1892) by the artist Henry William Pickersgill Oil on canvas, 1844

Richard Owen was an influential and ambitious palaeontologist and anatomist known for his critical views of other scientists' works. He was the leader of British comparative anatomy, known for coming up with the term 'Dinosauria', identified the dodo and Owen was the founder of the present Natural History Museum, London when it opened in 1881.

Did you know?

As an anatomist, Sir Richard Owen identified the duck-billed platypus as a mammal, and the gorilla as a new species of great ape.

<u>Activity</u>

Observe closely some of the interesting zoological specimens that you may chance upon in museums or anywhere else. Record your observations and share them with your friends. You may just make a new discovery!

TREASURES OF THE MIND



What are the creatures that had existed before? How do we know of their presence? How can finding out more about them help us answer essential questions to better understand our planet and its life?

These are some of the many questions that made visionary individuals of the past push boundaries and discover the fundamental scientific principles that underpin the natural world. Discover how these priceless treasures are still inspirational for today's scientists, and how they may help to provide insight into the biggest questions and issues our planet and species face in the future.



Moa feathers

Dinornis sp

New Zealand

Pleistocene/Holocene Periods, around 500 years old

Owen identified the Moa after the first discovery of its bones in 1839. Since then, scientists had found thousands of their bones which allowed the complete reconstruction of a moa skeleton. The only few feathers found allowed the first DNA-based reconstruction of the moa. Findings have shown that several species had existed. Scientists had hypothesised that the plain brown plumage that existed on all species was to help with camouflaging from the now-extinct giant Hasst's eagle which, until humans arrived, was moa's only predator.

Have a closer look

By observing the colours of the feathers, what type of environment do you think moas once lived in? What food do you think might have been available there for them to eat?



Owen's echidna dissection Tachyglossus aculeatus Australia

The short-beaked echidna in this jar was dissected by Sir Richard Owen. For decades across Europe, there was a raging debate over how echidnas and platypuses reproduce. Some claimed they laid eggs while Owen believed they incubated their eggs internally before giving birth to live young. Although Owen was eventually proven wrong, his anatomical research was of great value and had contributed significantly to our understanding.



Fossil bryozoans collected by Sir Charles Lyell Buskea Gran Canaria Pliocene Period, around 5 million years old

These fossil bryozoans were found by Sir Charles Lyell on a volcanic island between layers of ash and lava in Gran Canaria. As many species of bryozoan had become extinct, Lyell was able to use them to prove the extremely slow and gradual process of the volcano formation. This finding was also evidence to support Lyell's idea that the present is the key to the past.

1.



2.



Fossil shells collected by Sir Charles Lyell

- A rock-boring bivalve mollusc Lithophaga antillarum Madeira Pliocene Period, 5 million years old
- Casts of cerithioid gastropods
 Porto Santo, Madeira archipelago
 Miocene Period, 11–18 million years old

Discovering fossilised molluscs on the upper slopes of a volcano supported Lyell's theory that volcanic activity has been ongoing for a huge period of geological time. Volcanic activity on the island of Madeira had caused an underwater reef inhabited by molluscs to rise up, progressively surfacing the fossilised molluscs.

Delineation of Strata of England and Wales with Part of Scotland by William Smith 1815

The first ever map displaying a stunning three-dimensional picture of Britain's geology. On this hand-coloured masterpiece, each bright colour represents a different layer of rock. This was one of the nine sheets that formed William Smith's pioneering geological map of Britain.

Activity

Think of one of your favourite outdoor landscapes or picture an imaginary landscape in your mind, draw it out using contour lines to show the high and low ground to make a three-dimensional picture of your landscape.



Pigeon skeleton Columba livia (domestic variety) UK

In order to study how selective breeding had affected species, Charles Darwin kept and observed pigeons in his garden. Pigeon breeders had shown Darwin that it was possible to generate different offsprings by crossing pigeons with different characteristics. This helped Darwin conclude that if the characteristics of a single species may be manipulated in captivity, it is possible that all species in the wild can be manipulated by the environment.

Have a closer look

Observe the animals people keep as pets in your neighbourhood. Have becoming domestic pets, what physical changes do you think their bodies have undergone?

TREASURES OF EXPLORATION



During 18th to 19th century, curious explorers went on adventurous expeditions across vast oceans and remote lands, risking their lives to gather evidence of the rich diversity of life, leading to great discoveries in biology, oceanography and geology. Each expedition yielded vivid first-hand accounts and imagery of surprising new species, leading to crucial scientific discoveries that remain of huge value to us today. The treasures from these groundbreaking expeditions showcase the human spirit of endeavor, and consist of specimens from all over the world.



Sketch of the kamala plant by Sydney Parkinson (1770) Mallotus polyadenos Watercolour and pencil

This drawing was made by Artist Sydney Parkinson when HMS Endeavour arrived in Australia. However, Parkinson was overwhelmed with the immense amount of new specimens to illustrate at this point in time. Quick outline drawings with key colours added were done to save time. Unfortunately, the early death of Parkinson on the return voyage resulted in the incompletion of this illustration.

Activity

Bring out the artist in your and record the life in plants with sketches of plants that excite you on your scenic walks around parks and nature reserves.



Antarctic Fossil Wood Carbonised Wood Antarctica

Carboniferious/Triassic Periods, around 323-201 million year old

This piece of fossilised wood was collected during Robert Falcon Scott's second and ultimately tragic *Terra Nova* expedition to Antarctica. It is one of the earliest piece of evidence that Antarctica was once forested and has a climate that was once warmer than it is today.

Did you know?

Fossilised wood is sometimes also called petrified wood. When plant materials are buried by sediments over time, minerals from ground water slowly replace the original plant material – animal fossils are formed the same way.



Plant fossil Glossopteris indica Antarctica

Permian Period, around 299–272 million years old

This rock was spotted by Edward Wilson, chief of scientific staff in *Terra Nova* expedition. It contains the fossilised remains of an extinct species of plant called *Glossopteris indica* — which later provided evidence that Antarctica was part of a single landmass and eventually separated to form modern continents.

Activity

Have a closer look at the world map. Cut out the various pieces of landmass. Are you able to piece them all together like a jigsaw puzzle? Think of which plants and animals you know exist on more than one continent, do you think in the past, these continents might have been joined together?



Emperor penguin chick skin Aptenodytes forsteri Antarctica

This emperor penguin chick was one of the few that was ever studied, it was collected by Scott's party on the Discovery expedition in 1902. This chick's stage of development demonstrated that emperor penguins indeed lay their eggs during extremely dark winter conditions in Antarctica. Scott had planned to collect more penguin eggs during Terra Nova expedition for deeper understanding.

Activity

The male emperor penguin has to balance the females' egg between his legs to keep them warm during the bitter Antarctic winter. Experience what a male emperor penguin has to go through by placing a foam ball between your feet and walking around without dropping it!



HMS Challenger slide box

In the 19th century, many experts argued that there was no presence of life in waters deeper than 550 metres. However, the scientists on board HMS Challenger decided to put this theory to the test by making detailed observations and records of water temperature, ocean currents and sea floor depths. There, they managed to find life at depths of more than eight kilometres and also collected samples of specimens such as these fossilised micro-organisms.

Did you know?

The Challenger expedition discovered more than 4,000 new species of marine life! How many do you think there are still to find?

TREASURES OF LIFE ARE EVERYWHERE



Living organisms thrive in every corners of the Earth – be it in the deepest sea or on the highest mountains, at the frozen poles or in the hottest deserts. In the last 3.7 billion years, life has evolved and flourished to inhabit every type of environment found on Earth. The many treasures displayed in this gallery illustrates the vast variety of organisms' appearances and shapes for them to adapt to their current environment. This rich diversity across genes, species and habitats, as well as life's miraculous ability to adapt and survive various different environments is a true treasure of immeasurable value.



Insect collecting kit

This insect collecting kit contains a glass pooter for sucking up small insects, pin boxes and forceps and glass killing jars to kill captured insects with minimal damage. This kit was assembled and given to the Natural History Museum by Michael Chalmers-Hunt (1920 – 2004) who was an entomological historian.

Activity

Get some inspiration from this insect collecting kit and have a go at collecting insects by creating your very own insect-collecting kit. Is there any other equipment that you would add before you go on your own insect collecting adventure?

The use of black lights at night and nets may help you to gather insects for collection!



Claudina butterflies Prepona claudina South America

These vividly coloured butterflies live in the canopy of tropical South American forests. They rest with their wings firmly closed, revealing their patterned underside. Although rarely seen, their vibrant reds and blues show when their wings are open. Due to logging and deforestation of their natural habitat, the populations of some species are under threat.

Have a closer look

Why do you think they might have such brightly coloured wings? And why do you think their colours are rarely displayed?



Reindeer beetle Chiasognathus grantii Chile

The Reindeer beetle earns its name from its antler-like jaws which can be as long as its body length. The jaws are used for display and combat in males. During some fights, the males use their jaws to lift their opponent off the ground before flipping them over.

Did you know?

Despite the ferocious looking jaws, the Reindeer beetles jaws are not strong enough to produce much pain if they caught your finger!



Silver chafer beetle Chrysina limbata Central America

The highly reflective wing case of this beetle allows it to blend in with the many water droplets found in the wet cloud forests of Central America, confusing predators such as birds, reptiles and monkeys. The metallic sheen on the beetle's wing case is the result of several colourless thin layers covering the base colour pigment – creating an optical interference.

Activity

Create your own metallic sheen by adding one to two drops of clear nail polish into a bowl of water – observe how quickly the nail polish spreads over the water surface. Dip a piece of black paper into the water and let it dry to keep the metallic sheen.



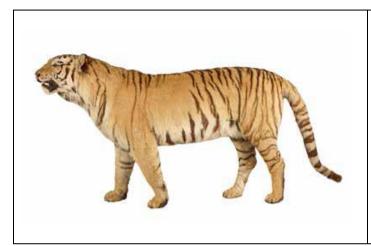
Sabre-toothed cat Smilodon fatalis USA

Pleistocene Period, 12,000 years old

It would have been possible to chance upon this killer cat after dark if you had been living in the Americas 12,000 years ago. With its terrifying long canine teeth and size similar to modern big cats, this species often ambushed large herbivores such as bison, giant ground sloths, camels, horses and possibly young mammoths. *Smilodon* went extinct at the end of the last ice age – suggesting that it is one of the few sabre-toothed cats that may encountered humans.

Did you know?

Despite its long intimidating canine teeth, the sabre-toothed cat had to hunt carefully due to its weak jaws, and to make sure it did not break these brittle canines.



Tiger Panthera tigris China

With only 3,000 tigers left in the wild, tigers are listed as 'Endangered' by the International Union for Conservation of Nature (IUCN). Tigers are often hunted illegally by poachers for their skin, bones, meat and folk medicinal values. In addition, rapid habitat degradation and destruction has contributed to the drastic decline in tiger populations in the last two decades.

Activity

Have a go at making your very own tiger in the galleries of *Treasures of the Natural World*. You may choose to bring it home, or leave it in its natural habitat in the virtual Rimbang Baling Wildlife Reserve at the ArtScience Museum.



Dodo model Raphus cucullatus

The dodo is the first animal species that humans beings exterminated in historic times. The dodo bird became extinct shortly after the arrival of humans on the islands of Mauritius. With the very few extant dodo bird specimens available, this model was made based on modern interpretations of the bird's anatomy – its exact appearance remains vague.

Did you know?

The dodo went extinct before humans could get a good look at them. Images made of them were based on descriptions by seafarers who had encountered the dodo.

Some experts suggest that this bird made a pigeon-like call 'Goo goo' which eventually earned its name – the dodo.

A MUSEUM FOR A MODERN WORLD



Natural History Museum cares for an expansive collection of unique treasures that form an indispensable record of nature. These treasures serve as an important resource for scientific research, enabling researchers to better understand our world and find solutions to some of the biggest challenges our planet faces today. With every generation, as the collection continue growing, new ideas, techniques and theories emerge, allowing the collections to speak in fresh ways. Playing a vital role in helping us to predict and mitigate the long-term impacts of climate change, these treasured collection holds the keys to unlocking the potential of the future through the mysteries of the past.



Jadarite Serbia

This mineral was discovered by geologists in the drill core from Jadar Valley in Serbia in 2006. Upon close analysis, scientists from Natural History Museum found its composition to be sodium lithium boron silicate hydroxide. This mineral is an incredibly close match to fictional mineral kryptonite. Short of fluorine, jadarite could have had the potential to drain Superman of his heroic powers.

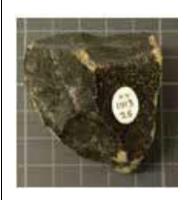
Did you know?

When exposed to ultra-violet light, the jadarite fluoresces a pinkish-orange colour.



Chrysoberyl, variety Alexandrite Sri Lanka

The scientific secret behind alexandrite's ability to have colour-changing features is the light-absorbing properties of the crystal and the light colour that falls on it. In the day, the stone absorbs yellow light and appears green. However, by candlelight (absence of blue light), the stone appears red.



Martian meteorite Nakhlite Egypt

The Martian meteorite landed on Earth in 1911, around 11 million years after a collision of a comet or asteroid with Mars blasted it out into space. Scientists from Natural History Museum found traces of clay in this rare Martian meteorite. As the formation of this mineral required water, it provided evidence that there was water, a vital ingredient for life, present in Mars. Such discoveries are rare as there are only 200 known Martian meteorites.

Have a closer look

Why do you think it is so important that scientists are finding out if Mars is able to support life? What are the other things that you think Mars needs for humans to be able to live there?



Morpho butterflies Morpho helenor peleides Colombia and Panama

The tiny transparent scales on these butterflies' wings scatter light when it hits them, creating interference patterns which we see as colours. These structural vibrant colours can never fade, unlike most objects which are artificially coloured with dyes and pigments. In bid to produce environmentally-friendly coloured products, Natural History Museum scientists are growing their very own butterfly wings' colour cells in the laboratory!

Did you know?

Traditional dyes and paints have the potential to release toxins into the environment. Research to develop colour producing cells could mean we could replace these with environmentally-friendly everlasting paint!

PROGRAMMES



Guided Tour (1 hour)

Guided by our trained facilitators, students can enjoy a tour of the exhibition which, through questioning, sharing and discussion, aims to introduce our place in the universe which is an issue of interest for many.

Workshop: Day in the Life of an Ornithologist (1 hour)

Have you ever wondered why eagles' talons are so sharp? Or why flamingos' feathers are so pink? Observe, experiment, record and role-play in this highly interactive and wings-on workshop where you can discover more about the natural world!

For more information, please contact Museumgroupbooking@marinabaysands.com

AFTER YOUR VISIT

Get students to share with the class why and what the most memorable display at the exhibition was. How had these valuable collections contributed to the modern society today? How did the exhibition change their impression of the natural world and how we should approach the natural world in the future? What will happen if humans decide to ignore the importance of the natural world? What can they do to help to spread the importance and conservation of our natural world?

Encourage students to continue expanding the collection for their own natural museum. Suggest students work with their friends and share with one another which specimens interest them the most and what else they would like to find out about them!