

Come *to* Our Future

Climate Change

遇見
大未來
地球環境變遷





遇見 大未來

COME TO OUR FUTURE
地球環境變遷 | CLIMATE
CHANGE



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國立臺灣博物館館長序

面對地球因人類過度開發所造成日益嚴重的環境問題，維護生物圈已然成為全球共同關注的焦點，同時也是二十一世紀自然史博物館被賦予新的社會責任。國立臺灣博物館長期致力以蒐藏、詮釋、研究，來解決生物多樣性保存所面臨的挑戰，並期望透過展示及教育資源讓社會大眾體認日常生活對自然環境的影響，提升其對生態保育的覺知，進而發展解決環境問題的態度、行動與技能，鼓勵人們落實環境友善的生活方式，共同打造一個可以滿足本世代以及未來世代生存的地球。

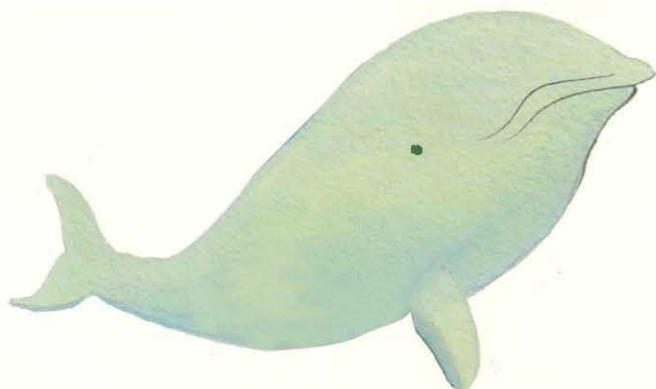
有鑑暖化問題的迫切性，本館以氣候變遷為主題規劃「遇見大未來—地球環境變遷特展」，展示內容以時間軸為架構，分成「給活在現代的你」、「給追求真相的你」、「給走向未來的你」三大單元。以地球演化歷程中文明崩壞及生物滅絕為前車之鑑，以及從冰芯、年輪、有孔蟲、古花粉等研究，探討氣候暖化的證據，據以思考目前全球所遭遇層出不窮的疾病、飢荒、水澇及乾旱等問題與氣候變遷的因果關係；終而引導民眾省思自身與未來環境的關聯性，承諾以積極負責的態度創造可期的未來世界。

老子云：「人法地，地法天，天法道，道法自然。」如何以謙卑的態度尊重自然萬物，與之共存共榮是本展所欲傳達的核心價值，更是當前人類面對地球環境所應具備的思維。希望藉由本展能凝聚每一顆關懷地球的心，共同為這片涵養我們的大地努力，讓後代子孫得以享用安全、美好的自然資源。

眾志成城，展覽順利展出有賴諸多單位及專家學者的協助，此次非常榮幸結合行政院農業委員會林務局、國立臺灣史前文化博物館、財團法人廣達文教基金會、臺北市立動物園、奇美博物館、國立海洋生物博物館、經濟部中央地質調查所、英國文化協會、財團法人翰林文教基金會、中央廣播電臺等機構共襄盛舉，不遺餘力共同為展覽策畫、展品徵集、活動推廣、行銷宣傳提供支援。在此，表達謝忱。

國立臺灣博物館 館長

陳濟民



Preface of Director of National Taiwan Museum

In the face of increasingly severe environmental problems caused by excessive development, how to balance the needs of the environment and economic growth has become a global issue. At the same time, many natural history museums around the world have taken on the responsibility of educating the public about environmental issues. For a long time now one of the tasks of National Taiwan Museum has been to lead the collection, interpretation and research of data on the challenges faced in preserving biodiversity. As part of this mission, the museum uses displays and educational resources to teach visitors how daily life impacts the natural environment. Broadly speaking, it is hoped that greater awareness of ecological conservation will help to promote the attitude, actions and technological developments needed to address the environmental problems the planet faces. This also encourages people to live in a more environmentally-friendly way as we work together for future generations.

The museum organized the "Come to Our Future: Climate Change exhibition." in part to reflect the urgency of global warming. The displays are organized chronologically and divided into three sections; "The Way We Are...", "In Pursuit of Facts" and "The Way We Will Be...". Utilizing the examples of collapsed civilizations and extinct species throughout human history and research based on ice cores, dendrochronology, foraminifera and fossil pollen, the exhibition examines the evidence for a causal relationship between climate warming and the seemingly endless illness, famine, flood and drought related problems that plague the planet today. In addition, visitors are encouraged to reflect on their own behavior and how it impacts the environment of the future, while people are called on to be more proactive in seeking a sustainable future for the planet.

Lao Tzu said: "Man models himself on the Earth, the Earth models itself on Heaven, Heaven models itself on 'The Way' and 'The Way' is modeled on Nature." This exhibition highlights the need to respect Nature and to learn how to coexist in ways that promote co-prosperity. It is our hope that the exhibition will bring together people, who concern about the future of the planet and that together we can find ways to coexist with Nature so that future generations will continue to enjoy everything the natural world has to offer.

This exhibition is the result of the collective hard work of numerous organizations and experts. I would like to take this opportunity to say a special thank you to the Forestry Bureau, National Museum of Prehistory, Quanta Culture & Education Foundation, Taipei Zoo, Chi Mei Museum, National Museum of Marine Biology and Aquarium, Central Geological Survey, British Council, Han Lin Culture & Education Foundation and Radio Taiwan International. For the outstanding effort of everyone involved in the curation of the exhibition, educational activities and marketing, I would like to say that you are the people who have made this exhibition possible. Thank you.

Director of National Taiwan Museum

Chi-Ming Chen

行政院農業委員會林務局局長序

林務局很高興繼 2007 年的「生命密碼—拯救生物多樣性」特展後，又再一次與國立臺灣博物館合作推出了「遇見大未來—地球環境變遷特展」，本展從人類的角度切入，規劃「給活在現代的你」、「給追求真相的你」、「給走向未來的你」三大主軸。讓民眾瞭解地球自然史演化之過程，地球免費提供人類清新的空氣、乾淨的水及食物等生態服務；生物在地球各種生態系裡甚至極端環境，適應環境演化並生存至今。

地球是所有生物的家，也是人類目前唯一能棲息的環境。在人類出現後，地球的環境逐漸改變，柏克萊全球變遷生物學計畫 (BiGCB) 動員來自各個優異學門超過 100 名科學家，整合了可取得的過去全球變遷資料顯示：人口成長、大範圍的破壞自然生態系以及氣候變遷等因素，將使生物多樣性下降，並且嚴重的影響我們賴以生存的漁業、農業、林業。

當人口數突破 70 億時，地球是否還能持續滋養我們，端視我們如何善待她。許多科學家都提醒我們地球已經逼近不可逆轉的臨界點。本特展希望引發民眾思考：人類要有未來，就要從現在開始尋找因應措施，重新建構人與蓋婭（大地之母）間和諧共生的相處之道。

行政院農業委員會林務局 局長

李桃生



Preface of Director-General of Forestry Bureau, Council of Agriculture, Executive Yuan

In 2007, the Forestry Bureau and National Taiwan Museum worked together on the "Codes of Life: Saving Biodiversity on Earth" exhibition. In light of that highly successful project we are delighted to be once again collaborating, this time on the "Come to Our Future: Climate Change exhibition." The new exhibition looks at the issue of climate change from a human perspective with displays organized around three central themes; "The Way We Are...", "In Pursuit of Facts" and "The Way We Will Be...". These are designed to give visitors a better understanding of the natural history of the planet, including the way in which Nature provides Mankind with fresh air, clean water and food, and how plant and animal life in various eco-systems and extreme environments have adapted to survive.

Although the Earth is currently the only habitat in which Mankind can live, the global environment has been changing ever since our ancestors first appeared. The Berkeley Initiative in Global Change Biology (BiGCB) has mobilized more than 100 renowned scientists from a wide range of fields to bring together all the data on global change we have, thereby highlighting the way in which such factors as population growth, large scale damage to eco-systems and climate change have reduced biodiversity and severely impacted areas such as fishing, agriculture and forestry on which many people rely for their existence.

With the global population already more than 7 billion, whether the Earth can continue to sustain so many people will depend on how we interact with the planet and protect the natural resources it provides. Many scientists say the planet is approaching the point of no return. This exhibition seeks to remind people that for Mankind to have a future, we need to start looking for answers now and to establish a new relationship with Mother Nature based on sustainable development and coexistence.

Director-General of Forestry Bureau,
Council of Agriculture, Executive Yuan

Tao-Sheng Lee

財團法人廣達文教基金會董事長序

「救球！同學這一球就靠你們了！」

這是生物關鍵存活的一球，也是我們唯一的一「球」，如果，人類還能遇見美好的大未來，這一「球」我們絕對要守住……

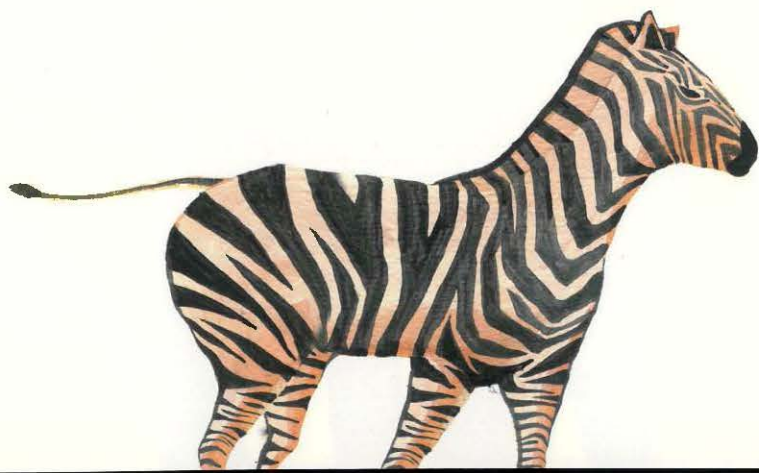
近年來地球環境劇烈變遷，人類面對更加嚴峻的考驗，廣達集團、廣達文教基金會很榮幸與國立臺灣博物館共同合作「遇見大未來—地球環境變遷特展」，從教育推廣著手，以謙卑的態度與積極行動力面對未來的挑戰，守住我們唯一的一個地球。

2012年9月，廣達將啟動《游於藝》校園巡迴展「遇見大未來」計畫，透過藝術家之眼以震撼性、話題性、延伸性、思考性的藝術圖像、影像等形式，讓更多孩子認識當代藝術家如何藉由影像、裝置、行動、媒材等多元藝術創作傳達他們對世界環境變遷議題的關懷與批判，引導孩子從生活中探索反思，關注人類生存與自然環境的關係，進而懂得學習尊重土地與生命的延續、身體力行地球村的公民意識，期望在文明的科技洪流之下，仍能以求真、求善、求美的心共同維繫永續家園。

相信國立臺灣博物館與許多重視環境教育的單位共同合作下，能帶給全民更全面的知識與視野，期待與大家一齊遇見大未來，遇見大希望。

財團法人廣達文教基金會 董事長

林百里



Preface of Chairman of Quanta Culture & Education Foundation

"Save the Earth! Students, the Earth is counting on you!"

This Earth is the biological key to our survival, and the only one we have; if mankind is to have any hope for the future, we must strive to protect it.

Over the past few years, the Earth's environment has seen several severe changes. Mankind faces a serious test. Quanta Group, along with the Quanta Culture & Education Foundation, is honored to be partners with the National Taiwan Museum in the "Come to Our Future: Climate Change exhibition." To save our one and only home, we must start with education, and with a humble attitude, face any and all future challenges together.

In September, 2012, Quanta will begin its "Travel Through the Arts Campus Tour: Come to Our Future." The tour will use, shocking, thoughtful, and topical artwork to discuss environmental issues from the perspective of artists. The goal will be to allow children to better understand how modern artists use a variety of mediums to express their concerns of environmental issues. Students will be guided to explore the link between mankind and nature. Our hope is to facilitate a greater respect among children for life on Earth, enhance civic awareness of environmental issues, and in the face of unprecedented progress and technologic development strive to build a sustainable future.

I sincerely believe that the National Taiwan Museum, in cooperation with many others who place importance on environmental education, can bring about a more comprehensive vision for all peoples to achieve a greater more prosperous future.

Chairman of Quanta Culture & Education Foundation

Barry Lam



策展團隊序

策展團隊大多是五年級生，出生的年代正是臺灣經濟與文明的轉折點，產業轉型以民營中小企業為主的進口替代工業、人口向都市移動、進入電視時代、識字率普遍提升、義務教育延長為九年等。同時期臺灣積極興建基礎建設，開始出現四層樓公寓住宅，逐漸採用鋼筋、加強磚等建材，自來水供應與供電普遍化。這一切改變，從當代人們的眼中看來是多麼令人期待，相信從此未來的世界是文明又進步的。現在是 2012 年，假若能夠詢問他們心中所期待的未來，是不是就像今日一樣？我們很想知道答案。

到底跨世代的人們對未來的期待是否相同？民國七十年代後出生的人，他們大都沒有在田裡捉泥鰍、用材火燒洗澡水、走一個小時的路去找玩伴的經驗，或許也從未享受過自由奔跑在自然原野的遊樂方式。生活的周遭充斥著商家、招牌、汽機車、電子產品等，這些景物對他們而言都是理所當然、伴隨長大的。在討論時聽到的民國五十年代臺灣景象，每張臉孔無不露出不可置信的表情。即使如此，他們所期待的未來，也不會是回到從前的臺灣！

文明是一種會令人上癮的藥，大家追求的未來是相同的，都是物質成長與科技進步；至於對未來環境變化的看法，大多數人關切環境的意識會持續提升，但是實質的環境改善以及人們行為的改變是有待觀察的。20 至 21 世紀是人類科學進步最快速的時代，其中自然科學家從不同的研究面向述說著「地球生病」的事實，但將之視為真相而採取行動的政府或個人仍舊有限？套用 2008 年出版的暢銷書《世界又熱、又平、又擠》作者湯馬斯·佛里曼在書上所說的，「不確定我們正走在哪一條路上，不代表我們不知道方向，兩者不可混淆。」從人類歷史中，我們看見過去地球改變的軌跡，也彷彿可以看見未來地球的演化。現在，我們正處於改寫地球歷史的交叉點上！



Preface of Curator Team

The curator team is comprised mostly of individuals born in the 1960s, during a turning point in Taiwan's economy and society. Changes that occurred during their lives include: an economic transition to small and medium private businesses focused on import, proliferation of television and mass media, increasing urbanization, a rising literacy rate, compulsory education being extended to nine years, etc. At the same time Taiwan experienced positive developments in infrastructure and construction, with the construction of residential apartments over four stories, and broader implementation of better building materials like, reinforced concrete and stronger bricks. Water and electricity provision has also seen remarkable improvement over this period of time. In the eyes of people today, the progress experienced over the last half century excites and gives them hope about the future. It is the year 2012. If we were to ask those individuals who grew up during this period of remarkable progress in Taiwan what they were most excited about the future, what would they say? We would love to know the answer!

Do people across generations have the same expectations of the future? People, born in Taiwan following the 1980s for example, may have never caught fish in the wild, used fire to heat their bathes, or walked an hour just to visit a friend, or perhaps have never enjoyed the freedom to simply roam through the wilderness. They have grown up surrounded by businesses, signs, cars, and electronics. When these people hear about life in Taiwan during the 1960s, they can hardly believe it. Even so, they are excited about the future, and are determined not to return to the way life used to be.

The process of civilization is an addictive. We all chase the future in the same way, by continuing to pursue material growth and technological progress. People's awareness of environmental problems is progressing as well, yet substantial environmental improvement and behavioral change remains to be seen. The 20th and 21st centuries have seen the fastest pace of human progress in the history of the Earth. Natural scientists from different fields maintain however the Earth is indeed "sick." Yet governments and people that both recognize that the Earth is sick, and resolve to take decisive action to heal it, are limited. Thomas Friedman's book, *Hot, Flat and Crowded*, published in 2008 says that "even if we don't know what road we are on, it doesn't mean we don't know what direction we are heading. The two should not be confused." From the history of mankind, we see the trajectory of changes in the Earth's past. It is also as if we can see how the Earth will evolve in the future. Right now we are at the intersection and about to re-write the history of the Earth.

一次獵殺一頭長毛象，是生存
一次獵殺兩頭長毛象，是進步
但一次獵殺兩百頭長毛象，則是進步過了頭



隆納·萊特，《失控的進步》

*Palaeolithic hunters who learnt how
to kill two mammoths instead of one had made progress.
Those who learnt how to kill 200 by driving a whole herd over a cliff had made too much.*



Ronald Wright, *A Short History of Progress*



給活在現在的你

The Way We Are...

城市獵人的足跡

The Urban Footprint



類的發跡只不過是地球漫長歷史的一瞬間，然而現代人類的生活方式已背離自然法則，朝向一條不可逆轉的道路前進，我們卻將它定義為「文明之路」。人類以城市建築取代原始的叢林，使用著過去生物的殘骸能源推進文明的巨輪，卻留給地球無法抹滅的痕跡。

現在，地球的氣候正朝向人類所謂「不正常」的狀態前進，全球暖化所造成的氣候異常，可能會引發世紀性的災難。到頭來我們不禁要問：進步和文明所為何來？

Humanity's rise to prosperity constitutes an infinitely small portion of the Earth's history. The lifestyle of modern human civilization, however, has already deviated from the laws of nature. The effects and consequences of the modern path to development are, many times, irreversible; we define this path as "the road to civilization." Humans have replaced prehistoric forests and ecosystems with modern cities and infrastructure. We have used the remains of past ecosystems to power our own development and in doing so have left an indelible legacy of that development.

Humans currently recognize the Earth's increasingly abnormal climate change patterns. Indeed, climate abnormalities resulting from global warming may result in catastrophic natural disasters. In the end, we must ask ourselves, "what is the true cost of development and civilization?"

地球樹屋

Home Sweet Home

「地球是所有生物的家，也是目前唯一的家。」

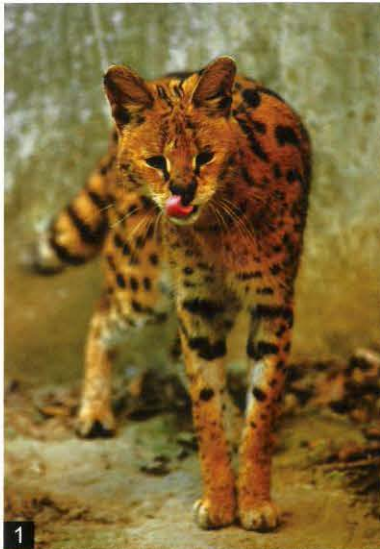
我們的地球與太陽的距離幾乎接近完美，造就出不可思議的適當溫度，使大部分的水維持在液態，讓生命的源起有了契機，因此，地球與生物（包括人類）成為密不可分的生命共同體。

"Earth is home to all living things; it is the only home we have."

The distance between the Earth and the Sun is nearly perfect. It has facilitated an incredibly stable climate that allows for huge bodies of liquid water that are necessary for the creation of life. The relationship between the physical environment of the earth and living organisms that inhabit it (including humans) is inextricable.







非洲區

Africa

非洲雖有黑暗大陸之稱，但卻是動物的天堂，各式各樣的大型哺乳動物在此生息，其中最高消費者，當屬獅子、花豹了；各種動物不但是種類繁多，數量更是龐大，如牛羚每年在遷徙季時都可聚集百萬頭之多；另外陸地上最大的動物「非洲象」，最大的鳥類「駝鳥」，也都生活在這塊陸地上。

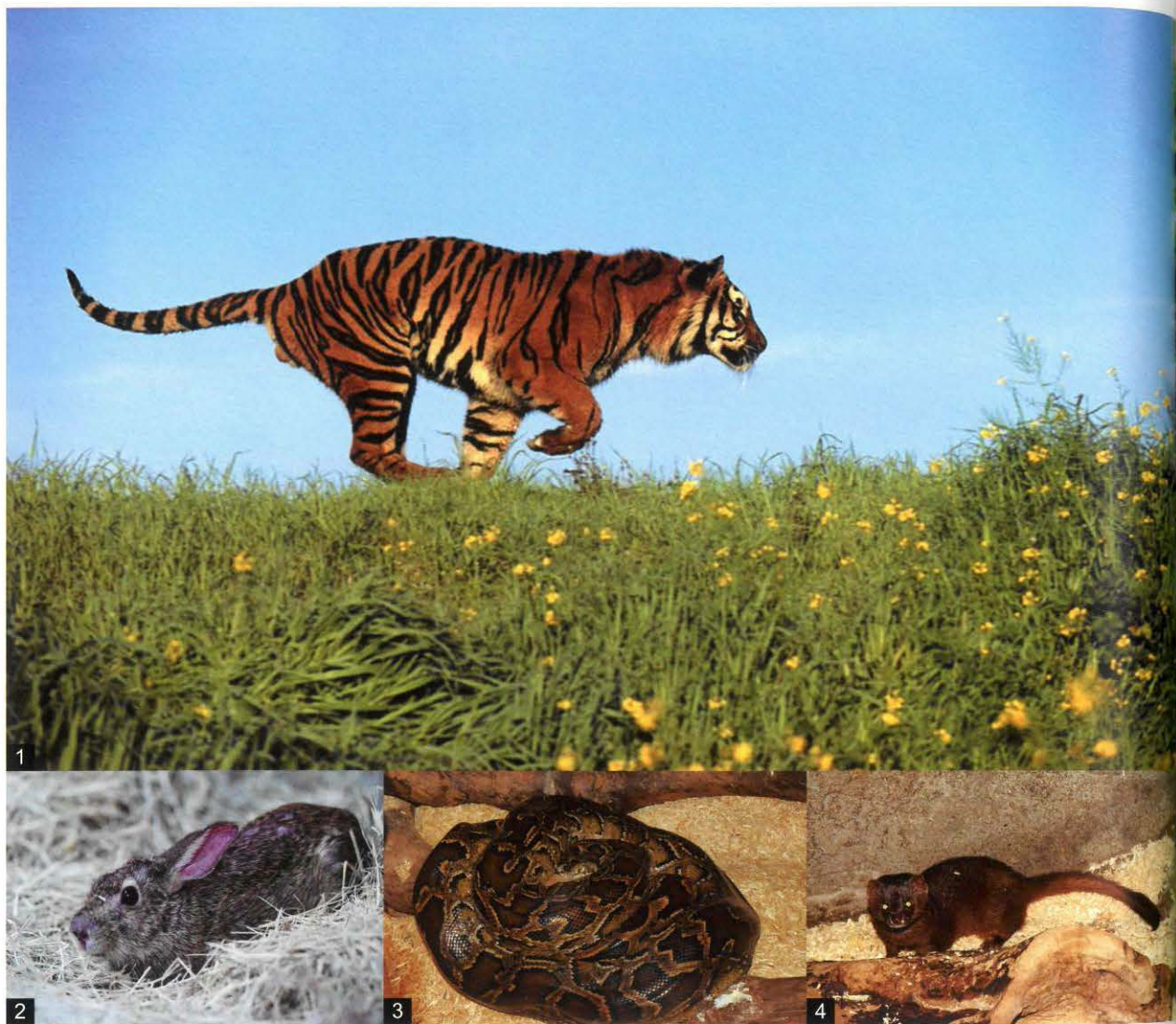


5

Photo1~3 : 詹德川

While sometimes called the "Dark Continent," Africa remains a paradise for animal life. A variety of large mammals live in the African wilderness, including top consumers like lions and leopards. Biodiversity in Africa is matched only by the sheer number of individuals present there. Wildebeest, for example, migrate in herds of over one million individuals. Africa is home to the largest land mammal on Earth, the African elephant, as well as the world's largest bird, the ostrich.

- | | |
|--|---------------|
| 1. 薮貓 Serval | 4. 花豹 Leopard |
| 2. 鸵鳥 Ostrich | 5. 獅子 Lion |
| 3. 叢尾豪豬 African Brush-tailed Porcupine | |



亞洲區

Asia

亞洲區地域廣闊，緯度更是由赤道延伸到北極圈，氣候帶變化大，地形更是複雜，有世界最高峰聖母峰，和陸地上最低的吐魯番窪地（海拔為 -154 公尺），造就了極豐富的生物多樣性。最漂亮的孔雀與最兇猛的老虎都在本區，另外「烏龜怪方蟹」則是世界上唯一生活在淺海火山口區的螃蟹。

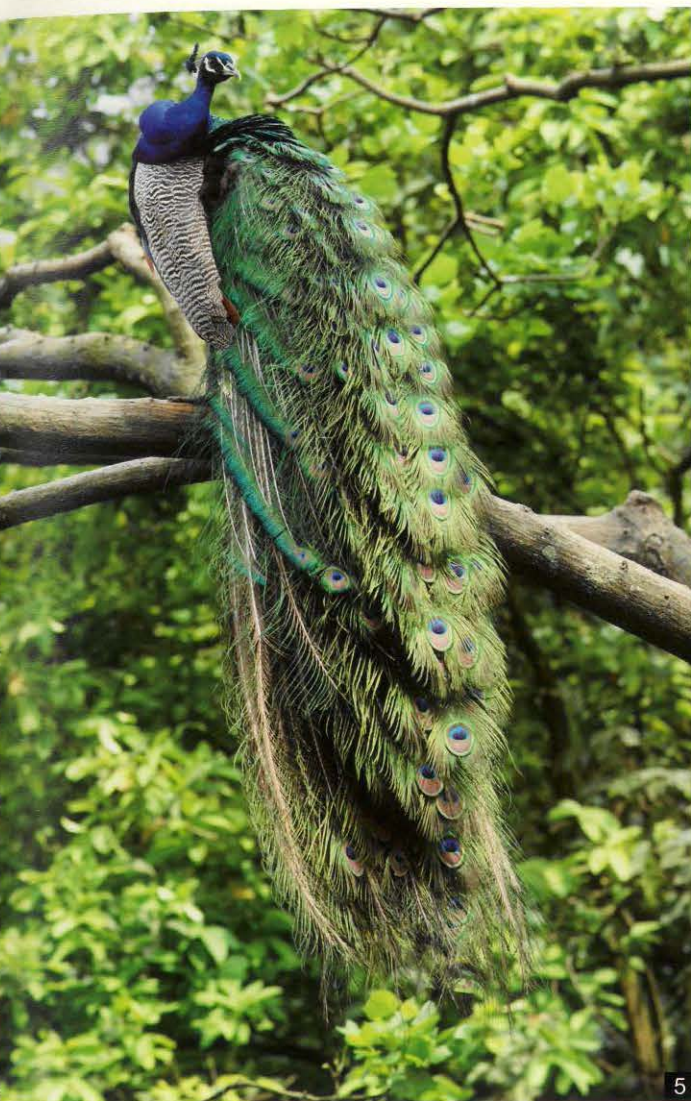


Photo2~7 : 詹德川

Asia is home to extremely diverse climate and biological conditions. The land mass extends from the equator all the way to the Arctic. Topographically the continent is also extremely diverse. The world's highest peak, Mt. Everest, as well as one of the lowest places in the world, the Turpan Depression (154m below sea level), is located in Asia. The highly variable latitude and elevations facilitate the existence of an extremely diverse array of species including: the peacock, the Asian tiger, and the only crab to live at the mouth of underwater oceanic volcanoes (*Xenograpsus testudinatus*).

1. 老虎 Tiger
2. 臺灣野兔 Formosan Hare
3. 緬甸蟒 Indian Python

4. 黃鼬狼 Golden Weasel
5. 藍孔雀 Common Peafowl
6. 藍鳥 Steere's Liocichla

7. 臺灣梅花鹿 Formosan Sika Deer

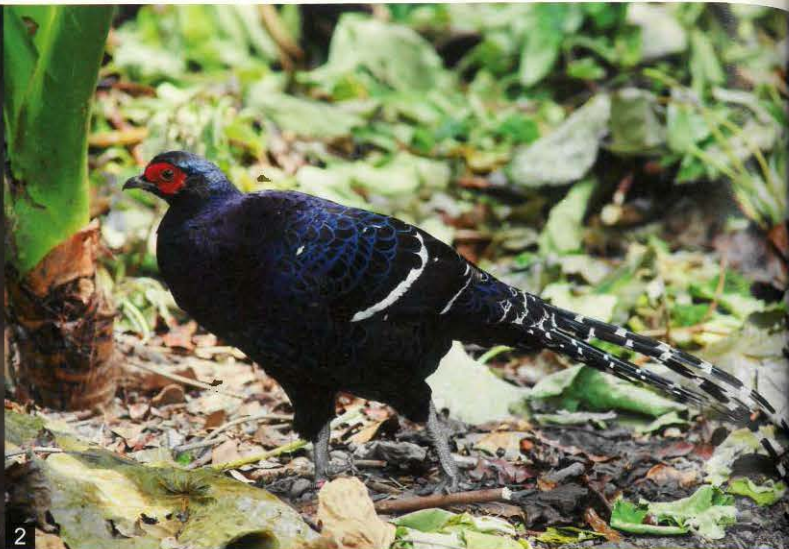




Photo2~5、7~11：詹德川

1. 貓熊 Giant Panda
2. 黑長尾雉 Mikado Pheasant
3. 藍腹鵝 Swinhoe's Pheasant
4. 澤巨蜥 Common Water Monitor
5. 臺灣大鍬形蟲 Formosan Giant Stag Beetle
6. 雙峰駱駝 Bactrian Camel

7. 水獺 Chinese River Otter
8. 臺灣黑熊 Formosan Black Bear
9. 山羌 Formosan Muntjac
10. 臺灣獼猴 Formosan Rock-monkey
11. 臺灣狐蝠 Formosan Fruit Bat



1



2



3



4



5

歐洲和美洲區

Europe and the Americas

歐洲和北美洲兩區雖然是開發程度較高的地區，但對於區內的生物多樣性的保護卻是不遺餘力，如早年因與人類的衝突而幾乎消失的灰狼，在有心人士的努力下，數量已提升不少；境內擁有世界上流量、流域最大的「亞馬遜河」；另外現存世界最大的蛇類森蚺和最大的齧齒類動物水豚等都生活在此區。



Photo3、6~8、10：詹德川、Photo11：江志緯

Despite the high level of development in Europe and the Americas, citizens and government take great care to promote environmental and species protection. Once nearly extinct, the gray wolf, for example, has made a remarkable come back thanks to the efforts of concerned citizens and government officials. The region is home to the world's largest river basin, the Amazon, as well as the world's largest snake, the anaconda, and the world's largest rodent, the capybara.

1. 黑熊 American Black Bear
2. 大巨嘴鳥 (鞭笞巨嘴鳥) Toco Toucan
3. 粉紅鸛鵒 Pink-backed Pelican
4. 雪兔 Mountain Hare

5. 馴鹿 Reindeer
6. 眼鏡凱門鱷 Spectacled Caiman
7. 巨水鼠 (海狸鼠) Coypu
8. 加拿大河狸 North American Beaver

9. 灰狼 Gray Wolf
10. 水豚 Capybara
11. 森蚺 Anaconda



澳洲和南洋群島區

Australia and the South Pacific Islands

本區的澳洲與各大陸分離較早，因此使得早期的哺乳動物有了獨立發展的空間，如卵生的哺乳動物「鴨嘴獸」、「針鼹」，有袋類的哺乳動物「袋鼠」、「無尾熊」等。而位於赤道附近的南洋群島則擁有大片雨林，及豐富的生物多樣性，如世界最大的花「大王花」、最高的花序「巨花蒟蒻」等都是本區的特有生物。



Photo1~7 : 詹德川

The Australian land mass and the other continents of the world separated relatively early on the Earth's history. This separation created an independent, isolated space for the animals there to evolve and develop.

Examples of this unique development include several oviparous (egg laying) mammals like the platypus and echidna, and various marsupial mammals like the kangaroo and koala bear. The region is also home to one of the world's largest flowers, the flower king (*Rafflesia*), as well as the tallest flowering plant, the titan arum (*Amorphophallus titanum*).

1. 紅喙巨嘴鳥 Keel-billed Toucan
2. 小天堂鳥 Lesser Bird of Paradise
3. 亞達伯拉象龜 Aldabra Giant Tortoise
4. 紅頸袋鼠 Red-necked Wallaby

5. 鸕鶿 Emu
6. 松鼠猴 Common Squirrel Monkey
7. 喋喋吸蜜鸚鵡 Chattering Lory



極地區

Polar Regions

不論是被大陸塊所包圍漂浮著大冰山的北極冰洋，或是覆蓋著厚厚冰帽的南極廣闊大陸，都是地球上最嚴酷的區域，兩處的共同點就是「極冷」。兩處的物種都爲了因應特殊的氣候，發展出相同的適應能力，都從海洋獲取食物，因此演化出了耐寒和擅於游泳的能力。如北極熊、企鵝、鯨魚、海豹等。



Whether you look at the Arctic, which is comprised of multiple landmasses surrounded by a frozen sea and huge icebergs, or the ice capped landmass of the Antarctic, both can be described in one word, frigid. Both regions are the harshest environments on Earth. Species in both regions, while distinct, have responded in similar ways to environmental pressures there. Polar bears, penguins, whales and seals, for example, have all responded to the similar environmental pressures that exist in both regions in the same basic ways, with the ability to swim well, resistance to extreme cold and the ability to catch marine prey.

1. 阿德利企鵝 Adelie Penguin
2. 北極熊 Polar Bear