

Animals

Art, Science and Sound

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Large print guide

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exhibition

Animals have always fascinated and inspired us. Continuing to learn about animals through this work can help us protect animal species from threats such as climate change and habitat loss.

In our pursuit to understand animal life, we have observed and recorded creatures in the wild for thousands of years using them to populate our visual, textual and sonic worlds.

Take a journey into the Library's rich collections and explore how we have documented animals through art, science and sound.

Recording animals

Our desire to understand the animal world has led us to explore different ways of recording our knowledge for a wide range of purposes from scientific research to artistic endeavour.

We have made visual records in paintings, drawings and photographs. We have produced written studies and audio recording technologies have enabled us to capture the sounds of animal life.

The written word

Nearly 2000 years ago the Roman author Pliny the Elder compiled one of the first written reference works on natural history. This page from a copy made centuries later describes a variety of aquatic animals including the common piddock, a mollusc that glows in the dark. *Historia Naturalis* covered a range of subjects including zoology, botany, medicine and agriculture.

Pliny the Elder, *Historia Naturalis* (Natural History). 1100–1200. Arundel MS 98, f. 85v.

Categorising animals

In modern science, all living things are organised in a hierarchical structure based on shared characteristics. Naturalist Carl Linnaeus first devised this system of taxonomy over 250 years ago. In this extensive tenth edition of his *Systema Naturae*, he classified thousands of species, giving each a unique scientific name.

Carl Linnaeus, *Systema Naturae* (The Systems of Nature). Stockholm, 1758. 956.e.6.

Importance of sound

The invention of recorded sound produced a completely new way of documenting animals. This technology has helped us discover new species and unravel the meanings behind their songs and calls. Audio identification guides, like this one of Mexican bird vocalisations, have taught us how to recognise animals by their sounds alone.

Cornell Laboratory of Ornithology, *Mexican Bird Songs*. New York City, 1958.
1LP0214913.

Artistic impressions

Art can be a powerful way of recording animals. British artist Jethro Buck wanted to spread awareness of animal conservation through this painting of the high brown fritillary, the UK's most threatened species of butterfly. Buck's work is influenced by South Asian art practices and natural history paintings.

Jethro Buck, *Fritillary*. London, 2019.
WD4598.

Cabinet of curiosities

Collecting specimens of living and preserved animals became a fundamental part of organising and understanding the natural world during the Renaissance. This sparked a trend of displaying personal collections, such as this 'cabinet of curiosities' owned by the apothecary Ferrante Imperato in the 1590s.

Ferrante Imperato, *Dell'Historia Naturale* (On Natural History). Naples, 1599. 456.b.9.

Darkness

To humans, accustomed to daylight, the darkness can be dangerous and frightening. But many creatures are at home in the dark, whether they are nocturnal, live deep underground or in the depths of the ocean. With heightened and completely different senses to our own, these animals have adapted to flourish in the dark.

The challenge for humans to observe animals living in the dark means that many species have remained a mystery to us. Artists, scientists and sound recordists have journeyed into the dark to try to capture these enigmatic creatures.

Bats

Bats are the only true flying mammal. Their ability to fly led early scholars to believe they were a strange type of nocturnal bird, but closer study revealed them to be a distinct group of mammals. Though traditionally divided according to their size and ability to echolocate as megabats or microbats, ongoing genetic research shows that these groupings, based on appearance and behaviour, are not as accurate as once thought.

Are bats birds?

This rare Arabic manuscript describes bats as birds, based on both Arabic and Greek traditions. The text notes that bats are the 'only flying creatures that give birth and suckle'. This manuscript shows how knowledge about animals was built and shared across cultures. Each animal's entry lists medicinal uses based on the work of Syrian physician Jibra'ī I ibn Bakhtishu' ibn Jurjis, alongside its classification by Greek philosopher Aristotle.

Ibn Bakhtishu and Aristotle, *Kitab na't al-hayawan* (Book of the characteristics of animals). Iraq, about 1225. Or 2784, f. 56r.

Funereal vampire bat

This life-size illustration shows a type of megabat, or fruit bat. Its indigenous name, written as *Al-wo-re*, sits alongside the scientific name. John Gould's *The Mammals of Australia* was the first comprehensive survey of Australian mammals and is one of the most significant contributions to the world's understanding of the region's unique wildlife.

John Gould, *The Mammals of Australia*. London, 1845–63. 74/462*.e.4.

A species of fruit bat

This watercolour of a fruit bat or megabat was painted for the British colonial official Dr Francis Buchanan-Hamilton, who was the superintendent of the Barrackpore Menagerie in the early 1800s. Buchanan-Hamilton arranged for a team of Indian artists to illustrate specimens to supplement his field notes. Artists adopted the western scientific approach and drew the specimen without any background on the page.

Unknown artist, *A species of fruit bat*.
Barrackpore, 1804–05. NHD3/517.

Echolocating microbats

Unlike most of their megabat relatives, microbats can echolocate. They produce high-frequency calls and use the resulting echoes to navigate and hunt in the dark. Bats that produce calls through their noses rely on 'noseleaves' to focus these sound beams. The elaborate nature of these facial structures can be seen in these illustrations of 13 species of bat by the German naturalist Ernst Haeckel.

Ernst Haeckel, *Kunstformen der Natur* (*Art forms in nature*). Leipzig, 1914. Wf1/1811.

Greater horseshoe bat

This watercolour of a greater horseshoe bat was painted by Edward Lear. Though best known for his nonsense poetry and limericks, Lear was also an accomplished zoological artist. This species of horseshoe bat is the largest in Europe. It takes its name from the lower part of its noseleaf, which is shaped like a horseshoe and is used for echolocation.

Edward Lear, *Horseshoe Bat*, 1832.
Private collection.

Bat detector with waveforms

The ability to record echolocation revolutionised our understanding of bats. The Holgate Mk VI was one of the earliest portable bat detectors. This machine belonged to amateur naturalist John Hooper (pictured) who used it to make some of the first sound recordings of British bats. The adjacent album contains visual representations of some of these recordings.

Holgate Mk VI bat detector and album of echolocation waveforms. 1960–75. WA 2009/018.

Weird and wonderful

Many animals, whether mammals, birds, invertebrates or amphibians, have evolved unique and unusual physical features to adapt their senses to their environment and allow them to thrive in darkness. The ways they hunt, mate and navigate their worlds mean they can often seem peculiar to us. However strange they might seem, these animals are perfectly adapted to a life in the dark.

Bushbaby

This artwork for a stamp shows a thick-tailed bushbaby, a species of primate found throughout central and southern Africa. This image highlights how this nocturnal species uses its large ears to detect prey and movement in the tree canopy. The bushbaby's ears move independently of each other and can fold to amplify the sounds of insects in order to pinpoint their locations.

Richard Granger-Barrett, Malawi
bushbaby stamp artwork. 1975. Malawi
888.

Star-nosed mole

The star-nosed mole lives underground, below swamps and marshes in North America. Functionally blind, this mole uses the star-shaped Eimers organ on its face to perceive its surroundings, sensing vibrations and smells. The organ is highly sensitive – it has five times as many nerve endings as the human hand. The star-nosed mole is one of only two animals known to be able to smell underwater.

John James Audubon, *The Quadrapeds of North America*, vol. 2. New York, 1854. C.135.G.5.

Giant Japanese salamander

This life-size illustration is one of the earliest western images of the giant Japanese salamander. The nocturnal salamander has very poor eyesight, but has a strong sense of smell and bump-like tubercles on its skin. These external sensory organs allow salamanders to sense movement around them. Their brown-black skin also offers the perfect camouflage for the environment of fresh flowing water in which they live.

Philipp Franz von Siebold, *Fauna Japonica*. (Fauna of Japan) Leiden, 1845–63. L.21.aa.4.

Oilbirds

Oilbirds are a nocturnal species of bird found in South America and the Caribbean. They have eyes that are adapted to the dark – with large pupils allowing for more light to be detected. Oilbirds also use echolocation to navigate through the forests and caves in which they live. Modern publications such as this identification guide continue to show our evolving knowledge of these animals.

Nigel Cleere, *Nightjars: Potoos, Frogmouths, Oilbird and Owlet-nightjars of the World*. Old Basing, 2010.
YK.2010.B.11926.

Trapdoor spiders

Trapdoor spiders take their name from the 'trapdoor' covering their burrow, made from a piece of soil hinged to the ground using the spider's silk. When hunting, the spider hides behind the partially open trapdoor and uses sensitive hairs on its legs to sense its prey, pouncing and dragging the prey into the burrow when it moves past. This unique method inspired the author to produce this in-depth study.

John Traherne Moggridge, *Harvesting ants and trap-door spiders: notes and observations on their habits and dwellings*. London, 1873. W17/7365.

Seeing into the deep

In the deep seas and oceans, where sunlight barely penetrates, animals live in almost total darkness. These regions are the most unexplored areas on Earth. Our knowledge of these animals was for a long time limited to the tales of seafarers or encounters with dead specimens. However, technological advances in the last hundred years have helped scientists and explorers begin to uncover the truths behind this environment and the animals that live there.

Monsters of the deep

Strange sea creatures fill the waters surrounding Iceland in this map. A description of each creature appears on the reverse of the map, which helps to identify some as real animals, such as the narwhal at the top right. Other animals, however, are now known to be mythical. The cartographer Abraham Ortelius produced this map in 1598 as part of the first modern atlas.

Abraham Ortelius, *Theatrum orbis terrarium* (Theatre of the orb of the world). Antwerp, 1598. Maps c.2.d.7.

Catesby's viperfish

This painting represents a predatory fish known as a viperfish. This duplicate painting made by the English naturalist Mark Catesby for the collector Sir Hans Sloane, shows their fang-like teeth used to capture prey. As viperfish live in deep water, this painting is based on a dead specimen caught off the coast of Gibraltar.

Mark Catesby, *Viperfish*. 1700–99. Add Ms 5267, f. 67.

Bioluminescent life

The ability to create light is found in many animals that live in deep water where sunlight cannot reach. It is mainly used to lure prey, attract a mate and defend against predators. These stamps, issued by the US Postal Service, show how everyday objects can be used to share scientific information. They highlight a range of marine animals that produce light, including jellyfish, octopus and worms.

US Postal Service, *Bioluminescent Life*. 2018. New acquisition, British Library philatelic collections: General Collection.

The giant isopod

The use of deep sea submersibles has revealed a variety of strange animals that were previously unknown to science.

Some of these, such as the giant isopod, grow much larger than similar animals that live in shallow water or on land, an effect known as deep-sea gigantism. The giant isopod shown here is a distant relative of the common woodlouse. It inhabits the deep, dark waters of the west Atlantic Ocean and can measure up to 50cm in length.

Claire Nouvian (ed.), *The Deep*. Chicago, 2007. LC.31.b.4301.

Film showing animal life deep under water, taken by researchers on board the submersible Alvin. Footage courtesy and © Woods Hole Oceanographic Institution.

First photographs of a living giant squid

In 2005, Japanese scientists observed a living giant squid in its natural habitat for the first time. These images, the first ever published, were taken at a depth of 900m by cameras attached to a baited fishing line. Before this, all human knowledge of giant squid came from dead specimens. The squid, the largest invertebrate in the world, is rarely seen alive and little is known of its behaviour.

Tsunemi Kubodera and Kyoichi Mori, 'First-ever observations of a live giant squid in the wild', *Proceedings of the Royal Society B*. London, 2005. (P)c00 - E (2).

The American barn owl

Barn owls are predominantly nocturnal animals – hunting, mating and rearing their young at night. They are facing population declines across the world due to habitat loss, climate change and urbanisation. This illustration of the American barn owl is part of John James Audubon's ambitious plan to publish life-size reproductions of all the birds of the United States and its territories.

The large and lavishly illustrated book took 12 years to produce and revolutionised ornithological illustration, by using the largest sheets of paper manufactured at the time known as double-elephant folios. This made the publication unique and costly to produce.

John James Audubon, *The Birds of America*. London, 1827–37. N.L.Tab.2.

Water

From freshwater to saltwater and frozen to boiling, the world's lakes, rivers, seas and oceans provide a home for a huge variety of animal life. Some of them are barely visible to the naked eye, while the blue whale is the largest animal to have ever lived. Many aquatic animals have been impacted by human actions, from fishing to climate change.

Our curiosity for these animals has led us across the seas and deep under water, though over 80% of the world's waters remain unexplored. Dive in and explore a glimpse of the aquatic creatures we have discovered – so far.

Sharks

Sharks are some of the most fascinating and feared animals on the planet. While some are the sharp-toothed predators of horror stories and fiction, there is huge variety among the 500 species of sharks in the world's oceans. Often misunderstood, these apex predators are top of the food chain and vital to the health of ocean ecosystems.

Dogfish and catfish

Prior to the widespread adoption of the word shark for these fish, most sharks known in Britain and Europe were called 'sea dogs' or 'dog fish'. The paintings on the left, dating from the 1600s, show two species of small sharks – now known as a dusky smooth-hound and a catshark, that are common to European and British waters.

Unknown artist, *A Book of Fishes Done at
Hamburgh, with Mr Ray's Notes.*
Hamburg, 1600–99. Add MS 5308 C.

Naming sharks

This broadsheet contains the earliest known use of the word shark in printed English. Containing an account of a 'strange fish' caught in the English Channel and displayed at Billingsgate fish market, the writer states that 'there is no proper name for it...but that certain men...doth call it a Sharke'. An illustration of the animal accompanies the account, which scientists have since tentatively identified as a thresher shark.

Unknown author, *The true discription of this marueilous straunge Fishe...* London, 1569. Huth50.(41.).

Dissected head of a great white shark

This engraving of the head of a great white shark was published with a dissection report written by Danish anatomist Nicolaus Steno. Steno noticed that shark teeth were identical to *glossopetrae*, or tongue stones, which people often wore as protective charms. His subsequent research revealed that *glossopetrae* were in fact the fossilised remains of shark teeth, formed over millions of years.

Nicolaus Steno, *Elementorum Myologiae Specimen*. (Elements of myology specimens) Amsterdam, 1669. 957.c.29.

Jaws

Published in 1974 and partly inspired by a series of shark attacks in New Jersey in 1916, *Jaws* and its subsequent film adaptation have reinforced our often negative perception of sharks. Yet the book's author, Peter Benchley, later said he regretted writing the book – noting that humans are far more dangerous to sharks than sharks are to humans.

Peter Benchley, *Jaws*. New York City, 1974. H.75/164.

The Philadelphia Inquirer. Philadelphia, 15 July 1916. Public domain.

Illustrated Police News. London, 3 August 1916.

Magnificent and misunderstood

Eugenie Clark, also known as Shark Lady, was a leading marine biologist and expert on sharks. This article, written by Clark, was published in 1981 and explores the public misunderstanding of sharks. Clark's research proved that sharks do not need to swim to breathe, that they can learn tricks and that they are not the mindless killers often represented in fiction and the media.

Eugenie Clark, 'Magnificent and misunderstood', *National Geographic*, vol. 160 (2). Washington, D.C., 1981.
AC.6192.

Hydrophones and recorder

Hydrophones are specialised microphones used to record underwater. These devices have played a crucial role in developing our understanding of the ways marine and freshwater animals communicate. Hydrophone recordings have shown that our seas, oceans, rivers and lakes are not silent bodies of water as once believed. Instead, they are full of sound.

Weirder in reality

Some of the strangest animals on Earth are found in water. For centuries, their bizarre appearances have fascinated scientists and artists alike. Transparent bodies, trailing tentacles, glowing appendages and skins that change colour are just a few of the unusual sights that we encounter in the aquatic world.

Squid

With their large eyes, eight arms and two tentacles, squids are certainly odd-looking creatures. They can change their skin colour, glow in the dark and eject ink to evade predators. The Italian naturalist Ippolito Salviani included these copperplate engravings of squid anatomy in his work on Mediterranean fishes. This was one of several publications that mark the beginnings of modern ichthyology (the study of fish).

Ippolito Salviani, *Aquatilium Animalium Historiae* (History of aquatic animals).
Rome, 1554–58. 41.i.10.

Lamprey

Lampreys are a type of parasitic jawless fish that suck blood out of fishes for food. In 1653, Leonhard Baldner commissioned drawings of animals local to his home city of Strasbourg, including the lamprey. This work is one of the first zoological studies of the region that would become influential among scholars. Baldner's work is exceptionally rare; only six copies are known to exist.

Leonhard Baldner, *Recht naturliche Beschreibung und Abmahlung der Wasser-Vogel...* (An exact natural description and delineation of the water-fowls...) Strasbourg, 1653. Add MS 6485, f. 50.

Duck-billed platypus

The author of the first scientific description of a duck-billed platypus initially believed the preserved specimen to be a hoax. The skin of the semi-aquatic mammal, with its beak-like mouth and webbed feet, had been sent to England from Australia by the Governor of New South Wales.

George Shaw published this description in the tenth volume of *The Naturalist's Miscellany*.

George Shaw, *The Naturalist's Miscellany*. London, 1789–1813. 954.g.1–24.

The immortal jellyfish

These tiny jellyfish, which are smaller than a fingernail, have the ability to return to an early developmental stage if affected by starvation, changes in temperature or physical injury. As this biological process could theoretically be repeated indefinitely, they have been nicknamed the 'immortal jellyfish'. Scientists only discovered this process in the 1980s and continue to research their regenerative abilities.

Juli Berwald, 'The Immortal Jellyfish', *Discover*, vol. 38 (10). United States, 2017. (P) BW 79 E (40).

Tardigrade

This illustration is one of the earliest images of the internal organs of these hardy and adaptable animals. Tardigrades live across the Earth, including in aquatic regions, and are incredibly resilient. They can survive extreme temperatures and atmospheric pressures, starvation, high levels of radiation and even the vacuum of outer space. Tardigrades are some of the smallest animals in the world, measuring up to 1.2mm in length.

Otto Frederick Muller, *Archives de l'histoire des insectes* (Archive of insect history). Switzerland, 1785. 461.d.20.

Film showing tardigrade moving through water under a microscope.

Misunderstandings

Although aquatic animals have long intrigued humans, we have not always managed to depict them accurately. These mistakes and misunderstandings resulted from incorrect translations, inaccurate descriptions or because the artist had never seen the real animal.

Lost in translation

The lion attacking a buffalo in this manuscript should actually be an alligator. The artist Dhanu, who had likely never seen an alligator, painted his interpretation of the Persian word *shir-i-abi*, meaning ‘water-lion’. The illustration is part of a later copy of the prince Babur’s memoirs and observations of plants and animals in South Asia. Decades after his death, artists at the imperial Mughal court in northern India produced this illustrated version, when the artist made this mistake.

Babur, *Baburnama* (Memoirs of Babur). Northern India, 1590–3. Or 3714, f. 393-394.

Monkfish

This inaccurate depiction of a monkfish highlights the value of first-hand observation. This publication was the first comprehensive collection of illustrated fish descriptions. The author Pierre Belon's image was based on an earlier written account from Scandinavia rather than his own observations. Belon described the fish as having a human head and face, similar to a monk's shaven head, while the body was covered in scales.

Pierre Belon, *De aquatilibus* (Of aquatic species). Paris, 1553. 446.a.6.

Swimming horses

It is unclear what real animal the artist of the aquatic horses in this book of beasts was attempting to illustrate. The largest appears to be part horse and part fish and looks similar to the hippocampus in Greek mythology. The illustration is at odds with the descriptive text, which refers to amphibians that 'have the habit of walking on land and function of swimming in water...as do seals, crocodiles, hippopotamuses, that is river horses'.

Bestiary. Salisbury, about 1255. Harley MS 4751, f. 68r.

Living colour

The challenge for humans to observe animals under water means that much of our knowledge of these animals has come from the study of dead specimens.

However, many species lose important features, such as their colour, once they have died. The importance then of accurately recording the living colour, in field notes, artwork and other forms of documentation is vital to our knowledge of these animals.

Original drawings for *Poissons, écrevisses et crabes*

These fantastically coloured illustrations of fishes and crustaceans may be attractive, but they bear little resemblance to any real species. Supposedly depicting animals from the seas around Indonesia, these original drawings were the basis for Louis Renard's 1718 publication *Poissons, écrevisses et crabes* (Fishes, crayfish and crabs). Despite their inaccuracy, Renard testified to the authenticity of the illustrations, perhaps pre-empting disbelief from European audiences who had never seen such colourful fishes.

Samuel Fallours, original drawings for *Poissons, écrevisses et crabes*. Holland, 1718. Add MS 5268, f. 9.

The fresh water fishes of Great Britain

Sarah Bowdich's publication is a rare example of the significant but often invisible role of women naturalists in history. Her work also shows an astute awareness of the value of recording living animals. For ten years, Bowdich travelled across the country to make her drawings. She wrote, 'every drawing has been taken from the living fish immediately [as] it came from the water it inhabited; so that no tint has been lost or deadened.'

Sarah Bowdich, *The fresh water fishes of Great Britain, drawn and described by Mrs T. Edward Bowdich*. London, 1838.
L.R.404.c.5.

Illustrations of 1000 shells

This Japanese text on malacology (the study of molluscs) highlights the importance of colour in the depiction of aquatic animals. The text included an index listing each shell's name in Japanese and Latin as well as the place of discovery. Although colour photography was available, the author arranged for this publication to feature traditional hand-coloured woodblock prints to ensure colour accuracy.

Yoichiro Hirase, *Kai chigusa* 貝千種
(Illustrations of 1000 shells). Japan, 1914–
22. Orb.30/8539.

Octopus and squid

Leopold and Rudolph Blaschka's handcrafted glass sculptures replicate underwater animals in astonishing detail and document their living colour. Marine animals such as octopuses, corals, sea slugs and starfish lose their shape and colour after they are removed from water and when preserved. Blaschka models, created to teach students in the 1800s are highly regarded for their scientific accuracy and for the skill required to create the glass sculpture.

Glass model octopus and squid. Item on loan courtesy of the Trustees of the Natural History Museum, London.

Fishes of the Ganges

Modern scientists praised these illustrations by Bengali artist Haludar for his precise and accurate use of colour. Haludar painted 104 drawings of fishes from the river Ganges in the early 1800s while accompanying East India Company officer Francis Buchanan-Hamilton on his travels in eastern India. Haludar's paintings of living specimens supplemented Buchanan-Hamilton's field notes. A group of fish illustrated by Haludar was re-named *Haludaria* in his honour in 2012.

Haludar, *Fishes of the Ganges*. India, about 1805. Mss Eur E72.

From dissection to X-ray

Anatomy – studying the form and structure of animals – has been used for centuries to understand how their bodies work. Until the invention of the X-ray, animals were killed and dissected to allow researchers to see beneath the skin. Illustrations in books and manuscripts allowed scholars to study the internal workings of animals. Today, technologies such as MRI scans allow researchers to visualise internal anatomy using non-invasive methods.

An X-ray of fish

Following the accidental discovery of the X-ray in 1895 by German physicist Wilhelm Röntgen, physicists in Vienna attempted to improve the technology. Josef Maria Eder and Eduard Valenta wanted to know how X-rays could visualise features such as bones, cartilage and fur. They X-rayed a range of animals including tropical fishes, a chameleon, frogs and a rat.

Josef Maria Eder and Eduard Valenta.
Versuche über Photographie mittelst der Röntgen'schen Strahlen (Experiments on photography by means of Röntgen's rays). Austria, 1896. 1818.c.4.

MRI and CT scans of a turtle

Modern imaging technologies such as MRI and CT have revolutionised the process through which we can understand the internal workings of different animals' bodies. This publication, aimed at marine biologists, details practical ways to care for injured sea turtles. These pages show how important MRI and CT imaging can be in diagnosing illnesses without invasive techniques such as surgery.

Charles A. Manire et al., *Sea turtle health and rehabilitation*. Fort Lauderdale, 2017. 639.977928.

Skeleton of a walrus

This illustration of a walrus skeleton was featured in a German scientific work that compared the skeletal structures of various animals. The shaded background indicates the external form. The image seems to predict how X-rays would later illuminate the interior structure without dissection.

Christian Heinrich Pander and Josef D'Alton, *Die vergleichende Osteologie* (The comparative osteology). Bonn, 1821. 74/1299.pp.6die.

Dissected turtle

Prior to modern imaging technologies, dissection was the only way to understand the internal organs and structures of animals. This watercolour painting shows a sea turtle that has had the underside of its shell removed to allow access to its organs. The artist shows the turtle's internal organs that have become visible after the removal of the heart and intestines.

Unknown artist, *Drawings and notes on human and animal anatomy*. 1500–1799.
Add Ms 5259 f. 140.

Disappearing homes

Ecosystems across the world are suffering due to the effects of climate change. Polar regions, coral reefs and their wildlife are in particular danger. Understanding how climate change is affecting these habitats is vital to improve our knowledge of the species that live there and how we can protect them.

Weddell seal

Herbert Ponting took some of the earliest photographs of Antarctic animals. He was the photographer for the British Antarctic Expedition (1910–13). This photograph featured in the *South Polar Times*, a magazine created by the expedition's crew, bound in sealskin and wood from the ship. As well as scientific observations, the magazine recounts the extreme conditions and personal anecdotes from the two voyages to the Antarctic by Captain Robert Falcon Scott and his team.

Herbert Ponting, 'Weddell Seal', in *South Polar Times*. Antarctica, 1911–12. Add MS 51039, f. 34.

Polar meltdown

Taken in 2007, this photograph captures the detrimental impact rising global temperatures have on polar regions. Showing a polar bear balancing precariously on top of a melting iceberg, the image became a major visual tool to highlight the impact of habitat loss for polar bears – which rely on sea ice to hunt and migrate. With the loss of sea ice, polar bears are having to hunt for land-based foods or risk starvation.

Arne Naevra, 'Polar Meltdown', *Wildlife Photographer of the Year*. London, 2007.
ZK.9.b.964.

Environmental map of the world

This map was created in 2005 to raise awareness of the growing impact human society is having on the Earth. Including data on the decline of the world's wild species, urbanisation, water usage and the impact of climate change, the map also highlights key environments, including Arctic sea ice and coral reefs that are increasingly affected by these issues.

'Environmental Map of the World', *The Independent*. London, 2005. Maps X.7592.

Death of a reef

Coral reefs are large ecosystems, on which a range of aquatic animals depend. The coral in this photograph is damaged due to a phenomenon known as coral bleaching, which occurs when coral is under stress from increased water temperature – primarily caused by climate change. The image held by the diver in the foreground shows the same reef alive and healthy years before.

David Doubilet, 'Death of a reef', *Wildlife Photographer of the Year*. London, 2021. ZK.9.d.964.

The living reef

Artist Andrew Riley created a series of postage stamps for the South Pacific island of Vanuatu featuring local marine life including these species of shrimp on a reef. Vanuatu is one of a number of island nations particularly vulnerable to the effects of climate change. Both human and animal populations are at risk from rising sea levels, extreme weather and increasing temperatures. These original artworks were the basis for printed stamps that circulated from 1989 and show the living reef in all its colour.

Andrew Riley, working designs for Vanuatu stamps. 1989. Vanuata 2067.

Fighting to survive

For centuries, humans have hunted whales for their meat, bones and their blubber to make oil. The growth of commercial whaling during the 1800s saw whale populations plummet. By the 1950s, many species were facing extinction. Pressure from scientists and activists led to an international agreement to end commercial whaling in 1982.

Illustration of whales

This manuscript contains painted illustrations of 14 species of whale known to the Japanese in the early 1800s. Each painting is annotated with the species' identifying physical features. This work is based on traditional Japanese practices used before the introduction of western technologies which dramatically changed international commercial whaling and caused a disastrous decline in whale populations.

Unknown artist, *Kujira no zu* 鯨之圖 (Illustration of whales). Japan, about 1820. Or. 917, f. 10.

The first Red List of Threatened Species

The International Union for Conservation of Nature (IUCN)'s Red List of Threatened Species is the world's most comprehensive source of information on extinction threats faced by animals today. The first Red List was compiled in 1964 and published in this report, the first of the World Wildlife Fund. Seven species of whale were included on the list, six of which were on the brink of becoming extinct.

Peter Scott (ed.), *The Launching of a New Ark*. London, 1965. W38/3350.

Recording whale song

Songs of the Humpback Whale is one of the most significant albums in the history of wildlife sound recording. It contains some of the earliest recordings of whale vocalisations and was used to raise public awareness of the barbaric and destructive impact of commercial whaling. The songs captured the hearts of listeners around the world and became an influential aspect of the Save the Whales movement of the 1970s.

Roger Payne, *Songs of the Humpback Whale*. United States, 1970. 1LP0214883.

Record-breaking edition of *Songs of the Humpback Whale*

Ten and a half million copies of an edited version of *Songs of the Humpback Whale* were pressed to be included with this issue of *National Geographic*. This remains the largest single pressing of a commercial record. Marine biologist and campaigner Roger Payne, who had recorded and analysed most of the recordings on the original album, wrote accompanying articles on humpback whales for the magazine.

National Geographic, vol. 155 (1).
Washington, D.C., 1979. DOC0002722.

Land

From forests to deserts, wetlands, mountains and plains, terrestrial animals have populated almost every landmass on Earth.

Animals such as boars, bison, deer and horses appear in the earliest human cave paintings, made over 40,000 years ago. Our closest and most familiar companions on Earth, land animals have been the focus of human documentation throughout history. To this day, scientists and naturalists continue to discover and learn more about these creatures.

Horses

Horses are one of the most important animals in human history. We have used them as a means of transport, in industry, warfare, agriculture and as symbols of prestige and power. Images of horses appear in some of the earliest cave paintings and have been the subject of medicinal and anatomical research throughout the world.

Garden of good health

This book of medical remedies states that horse milk can cure stomach ulcers and blocked noses. The *Ortus sanitatis* (garden of good health) marked a key point in the history of pharmacology and was innovative for including the medicinal properties of animals and minerals alongside plants. This holistic approach has led to *Ortus sanitatis* being considered one of the earliest encyclopaedic works ever printed.

Jacobus Meydenbach, *Ortus sanitatis*.
Mainz, 1491. IB.344.

Diagram of a horse's good points

Humans domesticated horses for transportation, warfare and equestrian sports thousands of years ago. For over 1,500 years, treatises on horses have been written in Greek, Sanskrit and Arabic. This Arabic treatise from 1223 lists 27 diseases that can affect a horse's extremities and the ailments of internal organs. This illustration shows a horse's good points; another illustration in the treatise marks a horse's 'defects'.

Abu Muhammad Ahmad ibn 'Atiq al-Azdi, *Kitab al-baytarah* (Book on veterinary medicine). Middle East, 1223. Or 1523, ff. 62v-63r

Anatomy of the horse

This work, by British painter George Stubbs, demonstrates the intertwining of art and science. After spending two years living in a barn in Lincolnshire where he dissected horse cadavers, he made accurate drawings documenting the skeleton, muscles, nerves and blood vessels in detail. Stubbs engraved and self-published this text not only for artists but also for veterinary students.

George Stubbs, *The Anatomy of the Horse*. London, 1766. 74/460.

Horse locomotion

Staging cameras and adjusting shutter speeds, photographer Eadweard Muybridge captured horses' movements using photography to prove that in gallop, all four feet lift from the ground. The horse breeder and California governor Leland Stanford had challenged Muybridge to help prove this theory. Years later, Muybridge published photographs documenting the movement of a range of animals, including capybaras and ostriches, in this publication titled *Animal Locomotion*.

Eadweard Muybridge, *Animal Locomotion: An Electro-Photographic Investigation of Consecutive Phases of Animal Movement*. Philadelphia, 1887. 11.Tab.a.

Plaster casts of horses' hooves

This set of plaster hooves and metal horseshoes was made to accompany a book of lectures given by the first professor of what would become the Royal Veterinary College. These casts and accompanying shoes, taken from different horses, were created to allow students to practice shoeing and treating different shapes and forms of horse hooves. This set was collected by King George III.

Charles Vial de Sainbel, *Lectures on the elements of farriery*. London, 1793.
44.h.26-27.

All shapes and sizes

Land animals are some of the most diverse and well-studied group of organisms on the planet. From tiny invertebrates to large mammals, terrestrial animals come in all shapes and sizes. Some are adapted to live all of their life on solid ground while others have a more hybrid existence, moving between land and water.

Wild mammals

The illustration of a zebra features in one of the earliest books on the history of Ethiopia. The encyclopaedic work contains indigenous knowledge and local names of animals provided by the Ethiopian scholar Abba Gorgoryos and was authored by German linguist Hiob Ludolf. The work records that the zebra's 'beauty exceeds all the four-footed creatures in the world' and that they are commonly known as *zecora*.

Hiob Ludolf, *Historia Aethiopica* (History of Ethiopia). Frankfurt, 1681–91. W 6696.

Domestic mammals

This fragment of ancient Greek papyrus records the mating habits of dogs. The papyrus states that dogs produce a litter of a maximum of 12 puppies and those born first will resemble their father while those born last, their mother. Written by Aristophanes of Byzantium, this later copy of the text provides a glimpse into historical understanding of physiological resemblance in animal families.

Aristophanes of Byzantium, *De Animalibus* (On animals). Egypt, 100–200 CE. Papyrus 2242.

Reptiles

These snakes are drawn as if in movement, slithering and curling on the page. The reptiles feature in Albertus Seba's *Thesaurus*, which recorded the natural history specimens he collected. This important publication includes illustrations alongside descriptions of the specimens. The work was normally issued in black and white, but this rare example demonstrates how some copies were carefully hand-coloured.

Albertus Seba, *Locupletissimi rerum naturalium thesauri accurate descriptio...*
(Detailed description of the richest treasures of natural resources).
Amsterdam, 1734–65. 43.k.3–10.

Flightless birds

Ostriches are one of the largest flightless birds living today. In the late 1500s, the influential Italian naturalist Ulisse Aldrovandi included two ostriches in his publication on ornithology. The complete publication featured 450 bird species. Striking large-scale woodblock illustrations were included alongside information on bird biology, mythology and medicinal properties.

Ulisse Aldrovandi. *Ornithologiae*
(Ornithology). Italy, 1599–1603. 439.m.1

Amphibians

There are over 5,000 species of frogs, ranging in size and colouring. The German naturalist and artist Johann Rösel von Rosenhof produced this hand-coloured publication to illustrate all frogs and toads native to Nuremberg. He observed the species in their local habitats to illustrate their lifecycles as well as dissecting frogs to record their anatomy.

Johann Rösel von Rosenhof, *Historia Naturalis Ranarum Nostratum* (Natural history of frogs of this land). Nuremberg, 1753–58. 43.k.15.

Invertebrates

This work by amateur entomologist (insect expert) Carl Alexander Clerck was the first comprehensive guide to the spiders of Sweden. Clerck's taxonomic classification of spiders was so accurate that his names are favoured over those suggested by Carl Linnaeus, who invented the classification system in use today.

Invertebrates are the largest animal group in the world, making up over 95% of all animal species. 50,000 of these are spiders.

Carl Alexander Clerck, *Svenska Spindlar* (Swedish spiders). Stockholm, 1757.

41.g.16.

Going, going, gone?

The world's biodiversity is declining with nearly 17,000 species of animal now facing extinction. The International Union for the Conservation of Nature's (IUCN) Red List of Threatened Species uses nine categories to assess the health of species, from Least Concern to Extinct. These globally accepted categories are powerful indicators of the conservation needs of animals today.

Bengal monitor

This watercolour of the Bengal monitor lizard is part of a series of artworks documenting regional wildlife in eastern India. Produced for Francis Buchanan-Hamilton, superintendent of the Barrackpore Menagerie, the artwork demonstrates the artist Haludar's astute ability to draw with anatomical accuracy. The Bengal monitor is Near Threatened as it is hunted for its skin and meat. It is found across South and Southeast Asia.

Haludar, *Bengal Monitor*. Barrackpore, India, 1804-07. NHD3/519.

Maned three-toed sloth

This influential publication is the earliest record of Brazilian natural history, documenting biodiversity as well as encounters between Dutch colonists and the indigenous population. The text records animal names in the now-extinct Tupi language alongside their names in Latin. The maned three-toed sloth, found in coastal Brazil, is pictured in an unnatural pose, as sloths cannot stand and move with their arms. It is classed as Vulnerable due to hunting and deforestation.

Willem Piso and Georg Marcgrave,
Historia Naturalis Brasiliae (Natural history of Brazil). Amsterdam, 1648. 443.k.7.

Red panda

Brian Houghton Hodgson was a major contributor to the study of the natural history of Nepal and the Himalayas. Hodgson worked with local artists to illustrate and record information on regional animals and botany. This drawing of the red panda from his collection is supplemented with measurements and notes written in the South Asian script Devanagari. Red pandas are Endangered due to poaching and trapping.

Unknown artist, *Red Panda*. Nepal, 1840–50. NHD62/62.

African lion

This Swahili guidebook details the 'Beasts and Birds of Africa' for a general reader. This page on the lion, known in Swahili as simba, includes information on their locality, anatomy and social interactions. The lion is listed as Vulnerable by the IUCN, as poaching as well as habitat loss affects populations.

H.W.D. Longden, *Wanyama nandege wa Africa* (The beasts and birds of Africa). London, 1949. 12912.e.30.

Indian rhinoceros

Miss Clara, a one-horned Indian rhinoceros, was paraded across European cities following her arrival in the Netherlands in 1741. Imported from India by Dutch sea captain Douwe Mout van der Meer, she was one of the few rhinoceroses to be seen by Europeans. The novelty of Miss Clara resulted in a range of paintings and sculptures, including this bronze statuette. Thanks to conservation efforts, Indian rhinoceroses have been saved from extinction but remain Vulnerable due to hunting.

After Peter Anton von Verschaffelt, *A Rhinoceros called Miss Clara*. Mannheim or Ghent, about 1770.

Victoria and Albert Museum. The Salting Bequest.

Yellow-tailed woolly monkey

D. R. Wakefield's monograph features an alphabetical list and etchings of animals that are likely to become extinct in the near future. The list includes the Asian elephant, the polar bear and the yellow-tailed woolly monkey, seen here. This monkey is native to Peru and is listed as Critically Endangered by the IUCN due to habitat loss.

D.R. Wakefield, *Alphabet of endangered mammals*. Goole, 2010. RF.2017.b.58.

Indian pangolin

The artist Shaikh Zain al-Din and his colleagues made over 300 paintings of local wildlife for Lady Mary Impey in Calcutta in the 1770s. Impey owned a menagerie and commissioned Indian artists to paint the animals kept there. This drawing of an Indian pangolin is representative of both the scale and painterly style that the artists used to illustrate living animals. Indian pangolins are Endangered due to hunting and habitat loss.

Shaikh Zain al-Din, *Pangolin*. India, 1773.
Add Or 4667.

Frogs

Amphibians are some of the most threatened animals on the planet. Alicia Bailey's limited edition artist's book was inspired by illustrations of frog anatomy found in the biology notebooks of her great aunt. It contains images of 17 species of frog, nine of which are listed by the IUCN as Critically Endangered because of disease and habitat loss. Some of these endangered species have only just been discovered.

Alicia Bailey, *Evanesco – a selection of beleaguered frogs*. United States, 2020.
RF.2022.a.133

Long distance travellers

People have long transported animals around the world as tools to aid diplomacy and to provide entertainment to the public. Viewed as exotic in their new environments, these animals fascinated people who had never seen them before. Their presence, whether as gifts or on display, has been well documented throughout history.

King Henry III's elephant

Depictions of elephants in early English medieval manuscripts were based on written descriptions rather than direct observations. In 1255 the French king Louis IX presented an African elephant to Henry III of England, who displayed it at the Tower of London. Matthew Paris drew this study after seeing the animal.

Unusually for the time, his illustrations pictured the elephant with knee joints, as people previously believed elephants not to have them.

Matthew Paris, 'Drawing and account of the elephant sent to Henry III by Louis IX of France as a gift in 1255'. Cotton Nero D. I, f.169v.

The hippopotamus at the Zoological Gardens

On arrival at the Zoological Gardens in London, Obaysch the hippopotamus became a great attraction and visitor numbers soared. The animal was a diplomatic gift from the Pasha of Egypt to Queen Victoria in 1850. The Spanish Count de Montizón, who had an interest in natural sciences and the newly invented medium of photography, took this image of the sleeping hippopotamus.

Don Juan, Count de Montizón, *The hippopotamus at the Zoological Gardens, Regent's Park*. London, about 1852.
C.43.i.7, plate 9.

Raja of Tanjore's cassowary

Raja Serfoji II had two cassowaries in his personal menagerie in Thanjavur, India by 1803. As this flightless bird is only found in Australia and New Guinea (an island in the Pacific Ocean), it is not known how the birds were imported to southern India. This painting features one of his double-wattled cassowaries; the handwritten notes include information on the bird's size and diet.

Unknown artist, *Double-wattled cassowary*. Thanjavur, India, 1800–03.
NHD7/1029.

The first camels in Japan

Dutch traders brought exotic animals to Japan in the early 1800s as diplomatic gifts to reinforce their monopoly on trade in East Asia. This manuscript features paintings of some of these animals, including dromedary camels, an elephant and a slow loris, which were presented to the shogun rulers of Japan. On arrival, the camels became a spectacle and were paraded through major cities.

Unknown artist, *Jurui shinzu* 獸類真圖
(Lifelike drawings of animals). Nagasaki,
about 1813–50. Or 913.

Red squirrels in South Asia

Red squirrels are not native to South Asia, however, they are featured in this painting produced for the Mughal emperor Jahangir. Having an avid interest in natural history, Jahangir arranged for artists to paint studies of exotic animals that were presented to his court such as a zebra from Abyssinia (Ethiopia). The naturalistic rendering of the squirrels suggests that the artist drew them from direct observation.

Attributed to Abu'l Hasan Nadir al-Zaman, *Squirrels in a Plane Tree*. Possibly Allahabad or Agra, India, 1605–8. Johnson 1,30.

Under the microscope

The invention of the modern microscope in the 1600s revealed a previously invisible world. Animals such as fleas, ticks and mites were brought into sharp focus, repelling and fascinating researchers and audiences alike. Microscopes are still used today to explore this microcosm of life.

Micrographia

Robert Hooke's *Micrographia* represents a turning point in our understanding of the microscopic world. *Micrographia* introduced readers to a range of incredibly detailed engravings related to animals, such as insects, feathers and fish scales. It quickly became one of the most popular scientific books of the time, with the diarist Samuel Pepys writing that it was 'the most ingenious book that ever I read in my life'.

Robert Hooke, *Micrographia*. London, 1665, 435.e.19.

Mandibles, or outer jaws of common spider

The technological advancements of the 1850s offered new ways to visualise microscopic details of invertebrates. This photographic print of a spider's mandibles was produced through the newly patented technology of the 'micro-photographic reflecting process' in 1856. The caption reads, 'As thus magnified, these appendages of the head are at once seen to be most efficient instruments for the capture and destruction of prey'.

William Henry Olley, *The Wonders of the Microscope*. London, 1857–61. 7004.c.24.

The Cheese Mites

The Cheese Mites was one of the first popular science films in cinematic history. It revealed the tiny mites that contribute to the production and flavour of some cheeses. The film was included in filmmaker Charles Urban's *Unseen World* series of short documentaries. The series premiered in 1903 and left audience members in a state of horrified fascination.

Courtesy of the BFI National Archive

Splendid-necked dung beetle

Photographer Levon Biss modified his camera by attaching a microscope to the lens to capture the detail of an insect's wing, hair and body. Biss took thousands of images and layered the digital files to create a single image. This print of the splendid-neck dung beetle, found only in Madagascar, reveals the myriad of textures and iridescent colours that cannot be easily seen with the naked eye.

Levon Biss, *Splendid-necked dung beetle*, 2021. Photo 1415(1).

Splendid-necked dung beetle
(*Helictopleurus splendidicollis*).
Madagascar, 2007. Oxford University
Museum of Natural History.

Tricoloured jewel beetle

Photographer Levon Biss photographed the historical insect collections held by the Oxford University Museum of Natural History using a combination of microscopy and photography to magnify each specimen. The explorer and naturalist Alfred Russel Wallace collected this specimen of a tricoloured jewel beetle in Indonesia in about 1859.

Levon Biss, *Tricoloured jewel beetle*, 2021. Photo 1415(3).

Tricolored Jewel Beetle (*Belionota sumptuosa*). Seram Island, Indonesia, 1859–60. Oxford University Museum of Natural History.

Shield bug

Charles Darwin collected this shield bug nearly 200 years ago in Western Australia during the second voyage of HMS Beagle. Historical specimens such as these are just as vital to researchers as contemporary ones. They can be used to track physiological adaptation over time, changing habitats, migration as well as changes in population numbers.

Levon Biss, *Shield bug*, 2021. Photo 1415(2).

Shield bug (*Poecilotoma sp.*). King George Sound, Australia, 1836. Oxford University Museum of Natural History.

See more stunning images from
Microsculpture by Levon Biss on display
in the Entrance Hall gallery from 12 May
until 20 November 2023.

Traces of the lost

When a species becomes extinct, all we have left are the records made of them. These records can tell us what species looked like, sounded like, where they lived and the reasons behind their extinction. They remind us of the fragility of the natural world and the impact we can have on it.

Lonesome George

Lonesome George was the last of the Pinta Island tortoises, native to the Galápagos Islands. A scientist first spotted George in 1971 and since then, no other tortoises of the same sub-species have been found. After his death in 2012, scientists raced to preserve samples of his DNA, which could be used in the future to bring the sub-species back from extinction.

Henry Nicholls, 'The legacy of Lonesome George', *Nature*, vol. 487 (7407), 279-280. London, 2012. P.P.2011.c.

Falkland Islands wolf

The Falkland Islands wolf was the only land mammal native to the Falkland Islands. People did not permanently settle on the islands until the 1830s, so the wolf had no natural fear of humans. Humans could easily lure and kill the wolves for their valuable fur and to protect the settlers' livestock. Charles Darwin encountered this species during his time as naturalist with HMS Beagle and predicted their eradication by human hands. The last wolf was killed in 1876.

Charles Darwin (ed.), *The Zoology of the Voyage of H.M.S Beagle*. London, 1838–43. 791.l.17,18.

St Helena giant earwig

The St Helena giant earwig was the largest of its kind, reaching up to 8cm in length. This original stamp design by Ian Loe was created for a set of stamps featuring local invertebrates issued in St Helena, an island in the South Atlantic Ocean in 1995. Loe noted that the species had not been seen for more than 20 years and was probably extinct. The giant earwig was officially declared extinct in 2014.

Ian Loe, stamp proof. 1995. British Library philatelic collections: General Collection.

The last thylacine

This film shows footage of Benjamin, once thought to be the last surviving thylacine (also called the Tasmanian tiger). The naturalist David Fleay filmed it in 1933 in Tasmania's Hobart Zoo, a few years before Benjamin died in captivity. In 2022, researchers discovered the preserved remains of a later thylacine in storage at the Tasmanian Art Gallery and Museum, a female who died in September 1936.

From the National Film and Sound Archive of Australia, colourisation by Samuel François-Steininger

Calls of the wild

Sound is vital to the animal world. It is how many animals communicate, whether for mating purposes, to avoid danger or just to keep in contact with each other. Animals produce sounds with their vocal cords, tails, legs and beaks. Artists and scientists have attempted to record and represent animal sounds in a variety of ways including written descriptions, illustrations, musical instruments and sound recordings.

Crickets

Crickets produce their characteristic chirping sound by rubbing the edges of their wings together in a process known as stridulation. This illustrated entry from a Chinese encyclopaedia, originally published in 1609, compares the call of a particular type of cricket to the rapid clacking of a weaving loom, a sound that would have been familiar to many readers at the time.

Wang Qi and Wang Siyi, *Leishu Sancai Tuhui* 三才圖會 (Illustrations of the Three Realms). China, copy from 1800–50. 15024.a.1.

Rattlesnakes

Rattlesnakes get their name from the rattle found at the end of their tails. The snake controls this hollow structure with its powerful 'shaker' muscles and uses the sound as a warning signal to potential predators. This image shows the typical posture of a rattlesnake, with its coiled body and raised tail. It was included in the first comprehensive illustrated guide to North American amphibians and reptiles.

John Edwards Holbrook, *North American Herpetology*. Philadelphia, 1842.
1258.k.3-6.

Animal Language

Animal Language was the first publication to use text and audio to describe methods of sound communication in animals.

Originally released in 1938, the book came with two records containing wildlife sound recordings used to illustrate points being made in the text. This union of text, image and audio created the first detailed study of animal behaviour where the importance of sound was recognised.

Julian Huxley and Ludwig Koch, *Animal Language*. United States, 1964.
1SS0001840.

The Hip-po-pot-a-mus

Musical instruments have a long history of being used to imitate the sounds of animals. This children's educational record from 1919 uses a drum-like instrument called a lion's roar to represent the calls of a hippopotamus. At the time, no recordings of this species existed, meaning that the producers had to rely on an artificially created alternative.

Talking Book Corporation, *The Hip-po-pot-a-mus*. United States, 1919.
9CS0029512.

Air

Up in the air live a host of birds and insects, using the space to move, eat and communicate.

Many of these animals have unique physical features that allow them to leap, fly and glide through the air. Without these features, these animals would not be able to migrate from place to place in search of food or mates, to escape predators, hunt prey or locate places to live.

These animals have inspired us. From the beauty of birdsong floating on the wind to the ability to fly, we have marvelled at aerial animals for centuries.

Birds of paradise

Known for their elaborate plumage, striking colours and dramatic courtship dances, birds of paradise are some of the most dazzling in the world. They have evolved their unique features in isolated rainforests in New Guinea, its surrounding islands and parts of eastern Australia. They have fascinated humans for centuries and our knowledge on these unique birds continues to grow.

Working drawings

Documenting birds of paradise is often difficult as they live high in the canopy, deep in the rainforests. The Australian artist William T Cooper made these sketches for a painting of a splendid astrapia. Cooper spent time in New Guinea observing the birds from life. This species is one of the most elusive and least studied of all of the birds of paradise.

William T Cooper, working sketching of splendid astrapia. Undated. Private collection.

Early beliefs

Western scholars once believed birds of paradise were strange animals, constantly in flight and living only on dew and sunlight. This belief came from the study of dead specimens, whose feet and wings were removed during the preservation process before transport from Southeast Asia to Europe. One of the earliest printed illustrations of a bird of paradise is seen here without feet or wings, in Conrad Gessner's zoological encyclopaedia, *Historia Animalium*.

Conrad Gessner, *Historia Animalium*
(History of animals). Zurich, 1551-1558.
C.84.d.1.

Blue bird of paradise

The blue bird of paradise has one of the most extravagant mating displays in the animal kingdom. The male bird turns upside-down on a branch near the female, fans out its blue plumage and sways backwards and forwards to move its two long tail wires. The Australian artist William T Cooper illustrates these birds within their natural habitat.

William T Cooper, Blue Bird of Paradise.
1991. Private collection.

Birds of paradise stamps and flexidisc

This 1965 issue of *The Stamp and Coin Collector* magazine contained the first commercially released sound recordings of birds of paradise. Best known for their elaborate mating dances, these birds also produce a variety of vocalisations. The recordings were made to accompany an article marking the release of a new set of stamps dedicated to birds of paradise and bowerbirds for Papua and New Guinea.

The Stamp and Coin Collector. 1965.
1SS0013813

A family affair

Research continues to reveal new knowledge about birds of paradise. Over a period of eight years, evolutionary biologist Ed Scholes and wildlife photographer Tim Laman, with the help and expertise of local guides, undertook the colossal task of documenting all of the species of birds of paradise on film.

Published in *National Geographic*, this pull-out poster features 15 genera from the bird of paradise family, informed by Scholes and Laman's research.

'Birds of paradise', *National Geographic*, vol. 222 (6). Washington, D.C., 2012.
Private collection.

Winging it

Flight has fascinated humans for centuries. We have tried to understand the mechanisms of bird flight through the study of wingspan, shape and structure, often captured in scientific and artistic works. We have also marvelled at the incredible migratory journeys that many birds undertake each year, which we have tracked and mapped across the planet.

On the flight of birds

The Renaissance polymath Leonardo da Vinci was fascinated by mechanical flight and observed birds to study gravity and flight. These sketches by Leonardo show the impact of air resistance and wind on a flying bird. The lower image illustrates a bird taking off and dipping down at the start of the flight due to the impact of its weight.

Leonardo da Vinci, *Codex Arundel*.
Florence, 1500–1508. Arundel 263, f.
166v.

Standing tall

This large-scale painting attempts to capture the impressive size of the male jabiru. The tallest flying bird in South America, they can measure 1.5m in height and have a wingspan of over 2.4m. As the painting is relative to the size of a male jabiru, it suggests that the artist painted from direct observation of the actual animal.

Unknown artist, *Jabiru*. South America, before 1820. Add Ms 11807, f. 11.

Flight feathers

A bird's ability to fly is aided by specialised flight feathers on their wings. Flight feathers help generate thrust and lift and without these feathers birds would not be able to fly. The primary flight feathers propel the bird through the air, while the secondary flight feathers allow them to sustain lift during flight. This image shows the wings of the white-fronted amazon, a species of parrot native to the South American rainforest.

Elizabeth Butterworth and Rosemary Low, *Amazon Parrots*. London, 1983. (VB) GD 29 (P30).

On the move

This map shows the migratory routes of 67 bird species that fly between North and South America. From small songbirds to large wading birds, this visual guide illustrates the incredible flights that many species make each year as they move between breeding and wintering grounds.

Gilbert M. Grosvenor (ed.), 'Bird Migration in the Americas', *National Geographic*, vol. 156 (2). Washington, D.C., 1979.
Maps CC.5.b.59 (2.).

Blown off course

The natural migration of animals does not always go to plan. This notebook from ornithologist Robert Stjernstedt contains his account of an unexpected sighting of an American songbird, the summer tanager, on Bardsey Island in Wales in 1957. The bird had been blown off course during its annual migration from North to South America, resulting in the first recorded sighting of this species in the UK.

Robert Stjernstedt, bird-ringing notebook. Wales, 1957–58. WA 2023/002.

Bird voices

Birdsong has fascinated and inspired humans for centuries. Musical notation and the written word were originally used to represent the songs and calls of birds. The ability to record and play back sound finally became a reality in the 1870s, allowing a completely new method of documentation to be used. Sound recording has helped unravel the meaning behind bird vocalisations, define new species, stimulate creativity and give pleasure to listeners all over the world.

Musical notation of birdsong

This encyclopaedia includes what is probably the earliest use of musical notation to represent the songs and calls of birds in a printed work. An accurate rendition of a nightingale's song is followed by musical and written interpretations of sounds produced by a range of domesticated and wild birds, including a parrot saying hello.

Athanasius Kircher, *Musurgia universalis* (Universal music). Rome, 1650. 59.e.19.

Early recordings

This gramophone record was the first commercially released recording of an animal. Engineers from the Gramophone Company in Germany wanted to see whether it was possible to record birdsong. Their experiments were successful and resulted in the release of eight records of nightingale song in 1910. They proved to be an instant hit with listeners.

The Gramophone Company Limited,
Actual Bird Record of a Nightingale (No. 1). 1910. 1CS0092356.

Songs of wild birds

The first audio identification guide for British birds was released in 1936. It contained recordings made by the pioneering wildlife sound recordist Ludwig Koch, who had arrived in the UK as a Jewish refugee just a few months earlier. For the first time, people could learn to recognise the songs and calls of common British birds from the comfort of their homes.

Ludwig Koch, *Songs of Wild Birds*. H.F & G Witherby Ltd, 1936. 1SS0001934.

Inspired by nature

The French composer Olivier Messiaen created several works dedicated to birds. *Catalogue d'Oiseaux* (catalogue of birds) features 13 pieces for solo piano, each one inspired by a particular bird and its surroundings. Messiaen often used musical notation to transcribe the songs and calls of birds he heard in the wild. However, he also transcribed tracks from published records, including those of British birds recorded by Ludwig Koch.

Olivier Messiaen, *Catalogue d'Oiseaux*.
1959. 1LP0215426.O.

The field recordist's handbook

The emergence of portable and affordable recording equipment in the 1970s saw the rise of wildlife sound recording as a hobby. No longer limited to record labels and broadcasters, the amateur enthusiast could now go out into the field and record the sounds of nature.

This recording handbook became an essential guide for any new recordist, offering advice on equipment, field craft and cataloguing.

Richard Margoschis, *Recording Natural History Sounds*. Barnet, 1977. (B) CB 142.

Audible archive

Wildlife sound recordists often build up extensive personal sound libraries during their lifetimes. These magnetic tapes form part of the collection of amateur recordist E.D.H. Johnson who spent over 30 years recording birds across Europe, Africa and Asia. The recordings are meticulously organised and annotated.

E.D.H. Johnson, unpublished field tapes.
1957–94. WA 2006/003.

Tools of the trade

Sound recordists in the 1970s and 1980s often used this equipment to record animals in the wild. The parabolic microphone, with its concave dish, amplified the song or call of the animal being recorded. This sound was then recorded onto tape using the Uher Report Monitor. Though portable, the equipment was still incredibly cumbersome by today's standards.

Uher Report Monitor 4000 IC, BL3522.
Grampian DP4 microphone with parabolic reflector, 1ARTS0000076.

Lost voices

Written records, art and sound recordings can teach us many things about extinct birdlife. Though their calls have been lost from the global soundscape, their vocalisations, appearances and behaviours persist through records collected at a time when these species were still living. For endangered birds, these records show us what we could lose if we do not act now.

The song of the last Kaua'i 'ō'ō

This tape contains the song of the last Kaua'i 'ō'ō. Habitat destruction and predation from invasive species, introduced to the Hawaiian island of Kaua'i over the last hundred years, reduced the once thriving population to a single pair. In 1982, the female died during a hurricane, leaving behind her male partner. It is his solitary song that can be heard here. The species was declared extinct in 2000.

John Sincock, Kaua'i 'ō'ō song. Hawaii, 1983. WS3398.

Wake Up Calls

The music on this LP was made entirely from the songs and calls of endangered British birds. It includes compositions dedicated to once familiar species such as the cuckoo and nightingale, whose numbers have fallen dramatically in recent decades. The album highlights the role that music can play in raising public awareness around current conservation and environmental issues.

Cosmo Sheldrake, *Wake Up Calls*. United Kingdom, 2020. 1LP0254765.

Carolina parakeet

The Carolina parakeet is an extinct species of parrot native to the US. The only parrot native to Georgia, the species went extinct primarily due to habitat loss, with the last captive individual dying in 1918. John Abbot's documentation on the birds of Georgia from over 200 years ago documents how prevalent the species was, highlighting the rapid decline since that time due to human encroachment.

John Abbot, *Drawings and natural history of the birds of Georgia, in America*. United States, 1804. Egerton Ms 1137, f. 28.

Ivory-billed woodpecker

Mark Catesby's illustration of the ivory-billed woodpecker provides a visual record of a once flourishing species. Although classified by the IUCN as Critically Endangered and despite claims that individual birds could still exist in parts of Florida and Cuba, most believe the species to be extinct. Habitat loss and hunting are the main reasons for the species' decline and only drawings, paintings, preserved specimens and sound recordings remain.

Mark Catesby, *The Natural History of Carolina, Florida and the Bahama Islands*. London, 1731–43. c.113.i.1.

Life cycles

Insects have some of the most fascinating life cycles in the natural world. Nearly 80% of species undergo some form of metamorphosis, a biological process of transformation, over the course of their life, while others make epic journeys of migration that take multiple generations to complete. Many questions over these transformations and life cycles still remain unanswered today.

The ground-breaking work of Maria Sibylla Merian

The pioneering scientist Maria Sibylla Merian travelled to Suriname, South America in 1699 to study and record the life cycles of insects. Her work, *Metamorphosis insectorum Surinamensium* (The Metamorphosis of the Insects of Suriname), is one of the most important entomological books ever published. Merian documented the life cycles of numerous insects from direct observation, many of which were unknown to European naturalists.

Maria Sibylla Merian, *Metamorphosis insectorum Surinamensium*. Amsterdam, 1705. 74/649.c.26.

The 17-year life cycle

Some species of insect have long life cycles that make studying their reproduction a challenge for researchers. Brood X represents a species of cicada with a 17-year life cycle. Newly hatched nymphs bury themselves underground for 17 years. They then crawl out of the earth, moult into their adult form, attract a mate and start the cycle all over again. This account from 1845 records the earliest documented emergence of Brood X in 1749.

John H. B. Latrobe, *Memoir of Benjamin Banneker, read before the Maryland Historical Society*. Baltimore, 1845.
10880.d.27.

Illustrating lifecycles

Amateur entomologist Elizabeth Anne Kemp conducted long-term studies on the lifecycles of various insects found in England. Her painting shows the death's-head hawkmoth life cycle, from caterpillar, to its pupal stage and finally the adult moth. Inscriptions on the painting show a range of dates in which she observed this moth and recorded its lifecycle. The moth gets its name from the markings on its thorax that resemble a skull.

Elizabeth Anne Kemp, *Drawings and watercolours of English insects*. 1803–25. Add Ms 17696-17698.

Migration of the monarchs

This edition of *National Geographic* published the first accounts of the discovery of the overwintering sites of a species of monarch butterfly. This discovery proved that the butterflies were undertaking a 3000-mile migration from their breeding grounds in the northern United States to Mexico every autumn. No single butterfly completes the migration; it takes four generations to complete the round-trip.

Fred A. Urquhart, 'Found at Last: The Monarch's Winter Home', *National Geographic*, vol. 150 (2). Washington, D.C., 1976.

Dimorphism

Sexual dimorphism is a term used to describe when different sexes of the same species exhibit different characteristics. A whole range of animals display sexual dimorphism, from varying sizes and shapes to different colours of plumage, fur, scales and even different defensive weapons.

Different colouring

Elizabeth Denyer's watercolours of butterflies and moths are an important example of the increasing role played by women in the natural sciences. This page shows Denyer's understanding of sexual dimorphism and how some male and female butterflies display differences through the colour and patterns on their wings. The paintings show both sexes of the purple emperor butterfly; although very similar, the male's wings have an iridescent sheen.

Elizabeth Denyer, *Paintings of butterflies found around London*. London, 1800. Add Ms 6895 f.34.

Different shapes

The paradise birdwing butterfly shows a marked sexual dimorphism in its colouring and form. The male of the species is smaller in size and has more delicate wing shape than the female. The male is also more colourful, with yellow and green colouring on its upper and lower wings compared to the black, white and yellow patterning found on the female.

Robert Henry Rippon, *Icones Ornithopterorum* (Icons of bird-wing butterflies). London, 1890–1907. 7296.i.4.

Understanding the role of dimorphism

Alfred Russel Wallace and Charles Darwin were central figures in zoology in the Victorian era. They spent many years corresponding on a range of topics including the role of natural selection of dimorphism in butterflies. In this letter, Darwin asks Wallace to clarify the importance of dimorphism in relation to species of swallowtail butterflies that Wallace was breeding for study.

Letter from Charles Darwin to Alfred Russel Wallace, 22 January 1866. Add MS 46434, f. 61-2.

Different weapons

Male Hercules beetles stand out for their distinctive black horns, which are used in combat against other males to settle mating disputes. Females, however, lack this feature.

Hercules beetles are one of the largest flying insects in the world and are native to the rainforests of Central and South America. Dru Drury was a keen amateur illustrator and entomologist who collected specimens from officers travelling on merchant ships.

Dru Drury, *Illustrations of Exotic Entomology*. London, 1837. 444.f.13.

Metamorphosis revealed

Knowledge of how some insects undergo metamorphosis has often relied on researchers cutting open the cocoon or chrysalis and killing the animal inside. Modern technology is now being used to understand this process in a non-invasive way. This study in 2013 used time-lapse 3D imaging to reveal the biological transformations occurring in a chrysalis.

Tristan Lowe et al., 'Metamorphosis revealed: time-lapsed three-dimensional imaging inside a living chrysalis', *Journal of the Royal Society Interface*, vol. 10 (84). 5052.1208.

Variety of life

Insects are the most diverse group of animals on Earth. More than a million individual species have been identified and named and insects are believed to account for more than half of all living species known. These objects demonstrate a tiny proportion of the variety of insect life recorded over centuries.

Dragonflies and other insects

This Japanese manuscript contains illustrations of a range of animals found in Japan. This section of the manuscript shows different species of mantises, stick insects, dragonflies, butterflies, moths and beetles, each accompanied by an inscription detailing either its colloquial name or describing its physical features. The manuscript includes insects found across Japan and attempts to organise them according to their external appearance.

Unknown artist, *Chuju zui* 虫獸圖彙
(Illustrations of animals and insects).
Japan, 1851. Or 1312.

Crickets and grasshoppers

This manuscript contains the original text and watercolour studies used in the first ever study of British insects that would be published in 1634. Compiling information from a range of contemporary sources, the manuscript contains over 500 illustrations of insects including species of grasshoppers and crickets.

Thomas Moffet, *Insectorum theatrum*
(Theatre of insects). London, before 1590.
Sloane Ms 4014 f.115.

Swarm of bees

This manuscript on animals was produced in Renaissance Italy, at a time when scientific knowledge on natural history was flourishing. The manuscript compiles scientific information from a range of sources including Aristotle's *Historia Animalium*. This manuscript shows a swarm of bees with illustrations at the bottom of the page showing the difference between a wasp (*vespa*) and a bee (*apes*).

Aristotle, *Historia Animalium* (History of animals). Italy, 1595. Add MS 82955, f.65r.

Hornets

Containing a mixture of descriptive text and illustrations, this manuscript details beekeeping in Japan, as well as associated insects found in the region. Hornets, like wasps and bees, are important plant pollinators but are often seen as pests.

Unknown author, *Mitsubachi densho* 蜜蜂傳書 (A treatise on bees and beekeeping). Japan, 1850–60. Or 1311.

Atlas moth

With a wingspan measuring up to 27cm, the atlas moth is one of the largest insects on Earth. They live in forests across Asia and are primarily nocturnal. Created in Sri Lanka in 1802, this illustration shows the moth almost life size and shows the detailed colouring and markings of its wings.

Eudelin de Jonville, *Quelques Notions sur L'Isle de Ceylon* (Some notions about the island of Ceylon). Sri Lanka, 1802. MSS Eur E82, f. 52.

Going forward

As we continue to observe and study animals, the art, science and sounds recorded through centuries past will underpin our evolving understanding of the natural world. Our journey of discovery is not over, but is constantly changing. Our library of knowledge continues to grow.

This journey will incorporate new technologies, bring in new voices and open fresh debates but will always be based on a desire to learn more. In this final section, hear from three contemporary voices as they discuss how art, science and sound continue to shape our knowledge of the animal world, their own inspirations and where they think this journey will take us next.

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Beyond the Exhibition

Join us for events inspired by the exhibition, at the Library and online.

bl.uk/more-animals

Tuesday 2 May, 19.00

Wildlife Conservation Now

A special event on the eve of the Coronation with Wildlife Trusts UK, RSPB and ZSL.

Friday 5 May, 19.00

Animal Magic: a Night of Wild Enchantment

With Andrea Arnold, Karen Joy Fowler, Katherine Rundell and Hamza Yassin.

Friday 19 May, 19.30

**Late at the Library: Calls of the Wild
with Cosmo Sheldrake**

Explore a world of wildlife sounds, images and song with an immersive evening of live music, performance and art.

Tuesday 23 May, 19.00

Under the Sea

Our panel of experts dive into the deep to explore life under the sea.

Thursday 25 May, 19.00

**Sounds Wild and Broken: Nature's
Sonic Marvels**

Professor David George Haskell on evolution's creative powers and on listening to the world.

Monday 5 June, 19.00

The Birds and the Bees...and Queer Cuttlefish!

Our panel of authors, science communicators and performers explore animal sexuality and celebrate nature in all its queerness.

Thursday 8 June, 19.00

Astonishing Animal Migrations

Wildlife TV presenter Patrick Aryee chairs a panel of experts to follow some astonishing feats of animal endurance.

Saturday 8 July

Michael Morpurgo: a Lifetime with Animals

One of Britain's best-loved authors and storytellers joins us at the Library.

And much more

Discover adult courses, family activities, school workshops and teachers events inspired by the exhibition at bl.uk/learning

Discover more Animals in these free displays

Levon Biss: Microsculpture

in the Entrance Hall Gallery

12 May – 20 Nov 2023

Animal Rights

in the Treasures Gallery

7 Mar – 9 July 2023

Hear more wildlife and environmental sounds from our collection:

RELAX: Wellbeing and sound experience

in the Treasures Gallery

28 May – 29 Oct 2023

Sound Gallery

on the Lower Ground Floor

Listening Desk

on the Upper Ground Floor

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Audio transcript

The Hip-po-pot-a-mus

The lazy hippopotamus

His cage is in oh what a mess

He really ought to buy a basin

To wash his dirty hands and face in

I guess his mother never taught him

Which is the reason that has brought him

Into this sad and sorry way

He wades and wallows half the day

And yet the more he bathes and

[unintelligible]

You see, the dirtier he gets

His cry [unintelligible]

So now he just says what's the use

He rolls and waddles in his tank

Or chews his cud upon the bank

Now isn't he the silly thing
Just hear him when he tries to sing
[laughing]
I love to watch him at his sport
I love to hear his happy thoughts
Be careful when he goes to bed
He tumbles in it on his head
Look out, he's going for a swim
Now watch him dive, hooray for him!
[cheering]