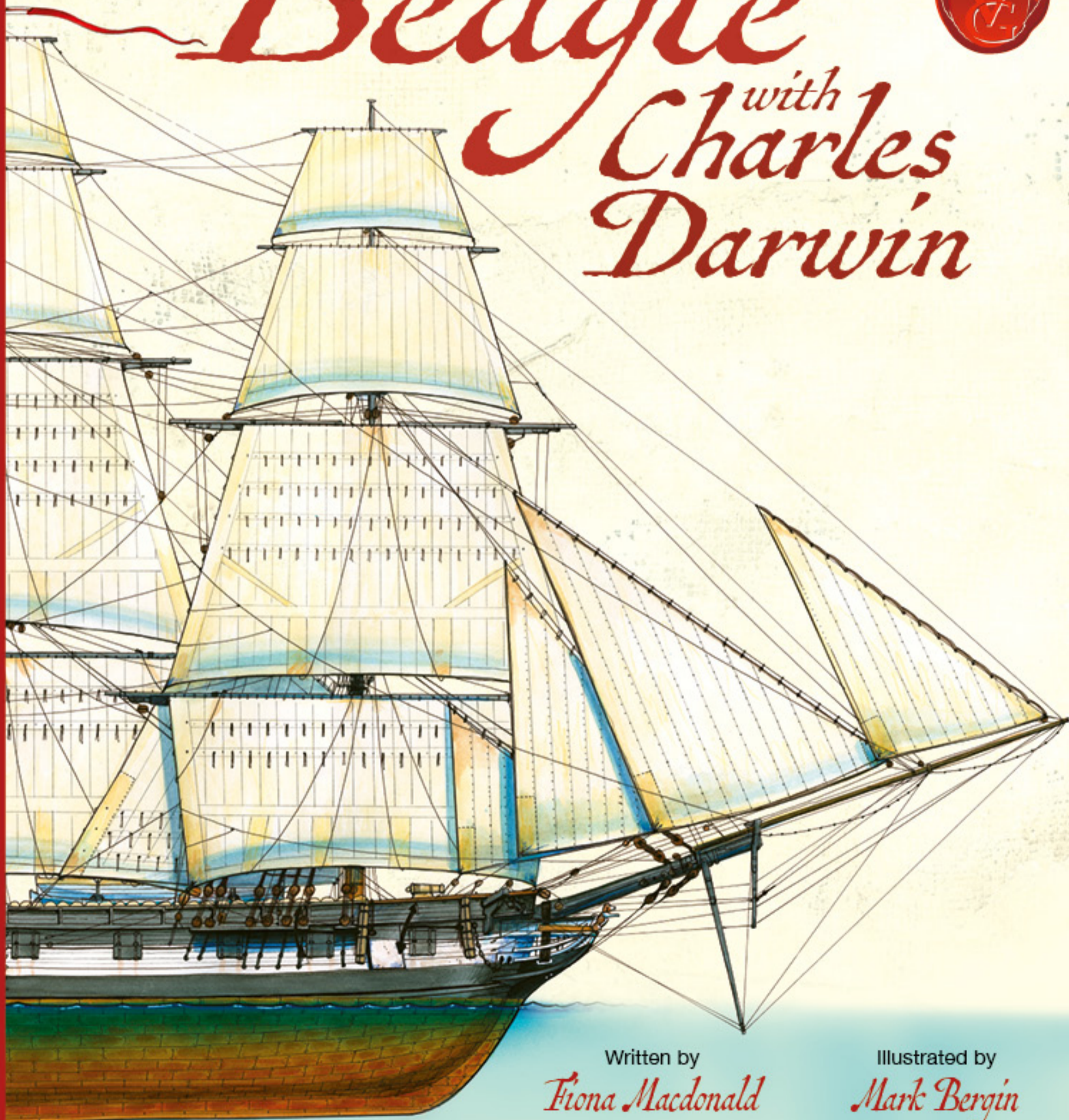


SPECTACULAR
VISUAL GUIDES



The Beagle

with
Charles
Darwin



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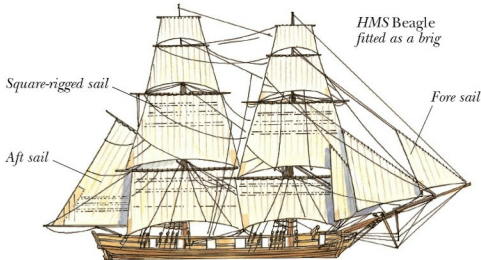
REFITTING AT PLYMOUTH

HMS *BEAGLE* was built at Woolwich in London, and was launched in May 1820. Made of wood, it cost the Navy £7,803 (equal to around £7.5 million today). For the first five years of its life, the *Beagle* stayed in dock, as a reserve. But in 1825 the Navy got it ready to send on its first voyage. The hull was covered with thin sheets of copper to protect it from wood-eating worms found in tropical seas. The main deck was re-built, and a new mast and rigging were added.

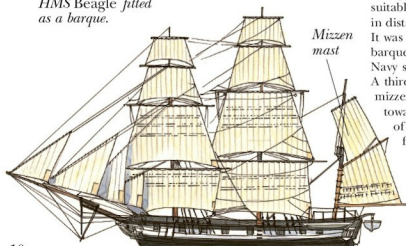
The *Beagle* set sail in 1826 and, in its

three years at sea, took a terrible battering. By the time Fitzroy planned a second voyage with Darwin on board, it badly needed repairs. In September 1831 Fitzroy and Darwin made eager plans for this new expedition. Full of excitement, they hurried by boat to Plymouth, where the *Beagle* was being re-fitted. But at first sight of the ship in dock, Darwin was horrified. The *Beagle* looked like a wreck! The masts were damaged, the deck was full of holes and the hull was leaking badly. No-one could sail in a ship like that!

Originally, HMS *Beagle* was built as a brig (right). This was a common type of Navy warship, used for coastal voyages. It had two masts, carrying square-rigged sails at right-angles to the mast. The lower part of the main mast was fitted with an extra 'fore and aft' sail, carried parallel to the deck.

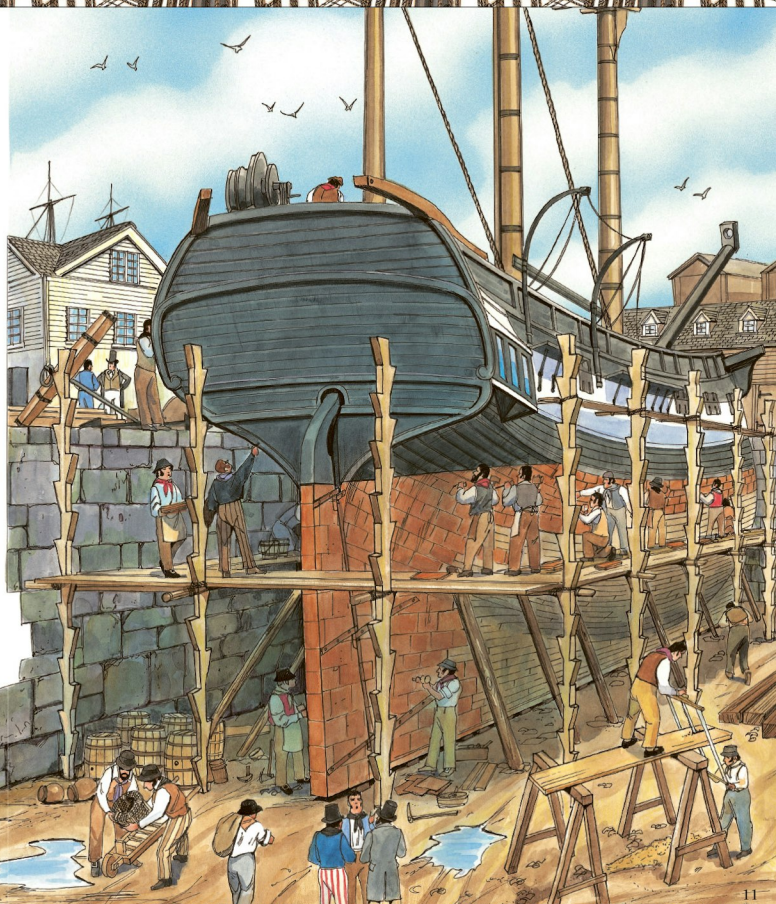


HMS *Beagle* fitted as a barque.



In 1825 HMS *Beagle* was changed to make it more suitable for survey work in distant seas and oceans. It was converted into a barque (another popular Navy ship design, left). A third mast (called a mizzen-mast) was added towards the stern (rear) of the ship. It carried fore-and-aft sails.

The new mast and sails made the *Beagle* faster and easier to steer. This was important in uncharted waters, where there might be shallows or hidden rocks around coasts or close to coral reefs. Surveyors like Darwin and Fitzroy needed a ship they could quickly steer away from danger.



By October 1831 the *Beagle* was repaired and watertight. It was ready to set sail to South America, then round the world. Its decks were scrubbed, and its masts and stays (ropes supporting them) were coated in pitch as a preservative. Its bilges (bottom of the hold) had been pumped clean of water.

READY TO SAIL

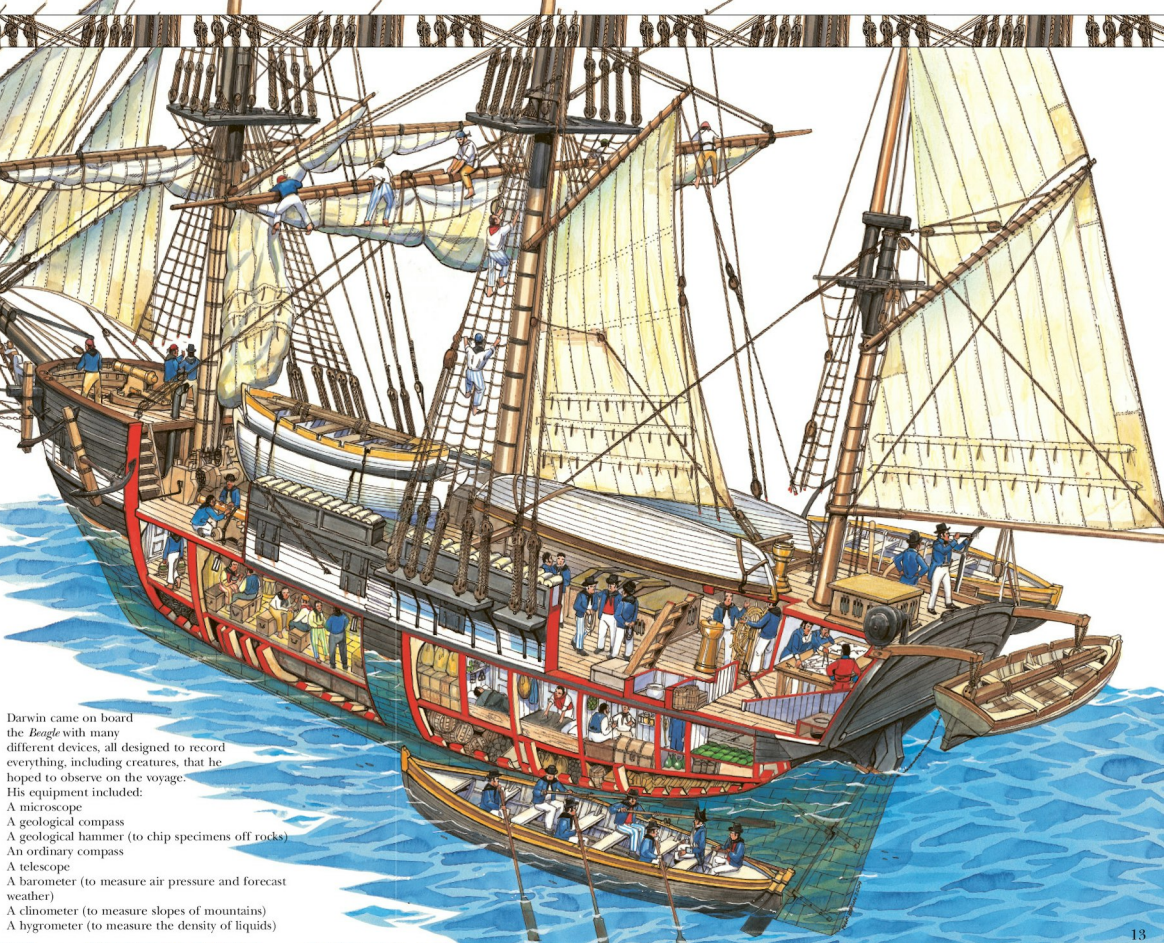
IN PLYMOUTH Fitzroy did his best to calm Darwin's fears. He promised Darwin that the *Beagle* would soon be seaworthy and ready to sail. Darwin went to Cambridge to ask his old tutor, Professor Henslow, to look after any specimens (examples) of wildlife he might send home from distant lands. Next he went to Shropshire to say farewell to his family. After this he travelled to London to buy more supplies for the voyage. He also visited museums to seek information and advice from experts. He wanted to find out all he could about plants, animals and rocks. He also practised taxidermy – preserving dead animals by curing then stuffing their skins to retain their lifelike appearance.

Meanwhile, back in Plymouth, repair work on HMS *Beagle* was taking longer than expected. Darwin did not mind. It gave him more time to consult experts in London. But at last the ship was ready. Loaded with scientific equipment, Darwin set out to join the *Beagle* voyage.

Darwin came on board the *Beagle* with many different devices, all designed to record everything, including creatures, that he hoped to observe on the voyage.

His equipment included:

- A microscope
- A geological compass
- A geological hammer (to chip specimens off rocks)
- An ordinary compass
- A telescope
- A barometer (to measure air pressure and forecast weather)
- A clinometer (to measure slopes of mountains)
- A hygrometer (to measure the density of liquids)



EXPLORING THE RAINFOREST

THE *BEAGLE* ENDED its Atlantic crossing and anchored off the port of Salvador, Brazil on 28th February, 1832. After a short stay it sailed south. Darwin had been suffering from seasickness, so he stayed on dry land while Fitzroy and his crew explored shallow seas along the Brazilian coast. While they were away, Darwin seized the chance to go exploring in the rainforest. In 18 days he travelled over 240 km (149 miles) on foot and horseback, then rented a cottage to use as a base for writing up his expedition notes and making scientific experiments. Darwin was amazed and excited by all the strange wildlife he observed. He eagerly recorded the size, shape and behaviour of all kinds of creatures, including monkeys, jaguars, vampire bats, frogs with suckers on their feet, spiders, fireflies, jumping beetles, and 'talking' butterflies that seemed to communicate with each other in a series of clicks. He was fascinated by massive tree-trunks covered in parasitic plants, and had to hack his way along paths blocked by rainforest creepers. He recorded amazingly heavy rainfall and disgustingly smelly fungi. Looking back at this time, he commented, 'It was impossible to wish for anything more delightful.'



In April, May and June 1832, Fitzroy steered the *Beagle* along the coast of South America, from Salvador to Rio de Janeiro. Then he sailed further south to Montevideo (now

in Uruguay). Everywhere the *Beagle* went Fitzroy made surveys and mapped the shore. On visits to Brazilian ports his crew purchased supplies for the next stage of the voyage.



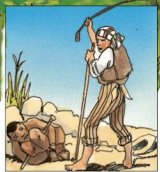
As the *Beagle* sailed its crew took soundings to measure the depth of the sea by lowering a weighted rope, marked in fathoms.

They collected samples of sand, mud and gravel from the sea-bed by dragging a wax-filled tube along the bottom.



While the *Beagle* was at sea Darwin stayed on shore. He rented a cottage near Mount Corcovado, inland from Rio.

He collected specimens, preserved them in spirit (alcohol), made notes, and sent letters home. Augustus Earle, the ship's artist, stayed with him.



Darwin was shocked and disgusted by the treatment of slaves in Brazil.



Darwin observed how monkeys used their prehensile tails to grip hold of trees.



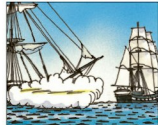
On the rainforest floor Darwin saw ants' nests nearly 4 m (13 feet) high.



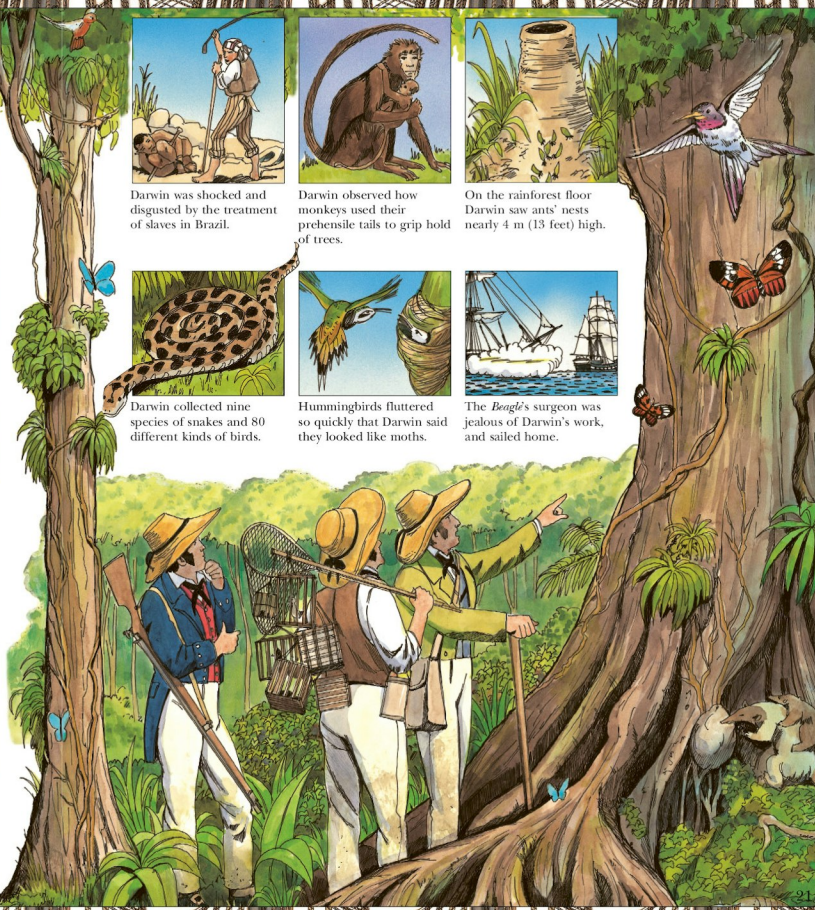
Darwin collected nine species of snakes and 80 different kinds of birds.



Hummingbirds fluttered so quickly that Darwin said they looked like moths.



The *Beagle's* surgeon was jealous of Darwin's work, and sailed home.



HOW, WHY, WHEN?

BACK HOME IN ENGLAND Darwin tried to make sense of all the new knowledge he had gained. He wrote scientific reports and edited his travel diary for publication. He read new works by other scientists, such as Thomas Malthus, an expert on human population. Slowly he became convinced that life on earth had not been created – either before or after the Flood – in the state that he had seen it in. He felt certain that all living creatures must have changed and developed over time. But how, why and when had this happened? Malthus's ideas about human populations gave Darwin a clue.

Malthus argued that humans and all other creatures have the ability to produce more offspring than can possibly survive. Among humans, population size is limited by the amount of food available. If food runs short the weakest people die. Darwin realised that this harsh fact of life might also be the reason why plants and animals changed. Only the ones best suited to their environment would survive. A bird might pass a useful characteristic, such as a longer beak, on to its descendants. Slowly, over the centuries, this would change the way a whole group of animals looked or behaved. Darwin called this process 'Natural Selection'.

In his journal Darwin looked back at the long years he had spent on the *Beagle* voyage. He had missed his family and friends. His girlfriend had married another man. He had lived in cramped quarters, eaten stale food and been terribly sick.

Although his scientific work kept him occupied, at times the vast ocean had seemed boring. But, Darwin decided, all these troubles and dangers had been worthwhile, because they had produced a 'harvest' of knowledge.

Darwin realised that Natural Selection could explain many of the things that had puzzled him on his travels. It was why the Galapagos finches were different from island to island. It was why rainforest orchids had such beautiful flowers – to attract insects to spread pollen to fertilise them. It was why some beetles were the same colour as the vegetation they lived on –

the camouflage protected them. It was even why fossils were different from their living relatives – they had died out because they were the weaker forms of their species! Developing his theory, Darwin also realised that Natural Selection might explain why embryos from different species often looked the same. You can read more about this on pages 40 and 41.

Tool-using finch from the Galapagos Islands

Chick embryo at four weeks

Human embryo at four weeks

Beetle camouflaged as a leaf

Self-pollinating orchid

Fossil skeleton of *Mylodon darwini* and the modern armadillo to which it is related

Sea shell preserved high in the Andes