

To boldly know...

...what no man had known before: that became Charles Darwin's legacy, and burden. How did he feel about it? He certainly recognised the implications of his theory of evolution. But he could not invent evidence to deny it, he wrote in his diary. How did he, an aspiring priest, end up on the HMS Beagle? What was it he saw, that made him ask the questions he asked? What does it take for someone to look at the world the way he did? And what lessons can we draw from his worldview? A tribute, in his 215th birth anniversary year

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In 1859, a single man changed forever how we use the word evolved.

The term migrated to English as a way to indicate significant movement (as with military manoeuvres). Its roots were in the Latin *evolutio*, for the unfurling of a scroll.

Now, Charles Darwin was suggesting that all living creatures "evolved" through the inheritance of small variations that helped them compete, survive and reproduce.

"There is grandeur in this view of life," he wrote, in *On the Origin of Species* (1859), adding, "Whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved."

It all began, for him, with a question that nibbled away at him, as he sailed through unfamiliar islands on the HMS Beagle, a young naturalist in the company of surveyors and researchers, all on a scientific mission.

The question that formed was this: What caused so many kinds of living things to take shape in the world, some with only the tiniest physical differences?

It was a dramatic question to ask — arguably as dramatic as the one Nicolaus Copernicus posed some 300 years earlier: Is it possible that everything in the skies does not revolve around our Earth?

What does it take to become the kind of person that questions the world in this way? How do they deal with the ripple effects of the answers they confront? And what might we borrow from such a spirit of inquiry, in our conflicted, troubled age?

"We should perhaps think twice about the juggernaut of natural selection that we are chipping away at through careless consumption," says Jahnvi Phalkey, a science historian and founding director of Science Gallery Bengaluru, "What we are perhaps missing most today is the grand intellectual ambition to ask unreasonable questions about this intriguing planet we inhabit." Here, then, is a look at Darwin's unique legacy, 215 years after his birth.

Charles Darwin was born into a wealthy family, in 1809, the fifth of six children. He grew up exploring the fields and woodlands around the family's seven-acre estate, in the market town of Shrewsbury in England.

His father, Robert Darwin, was a physician; his mother, Susannah Wedgwood Darwin, was from the family renowned for its brand of luxurious fine-bone-china crockery. The Wedgwoods and Darwins were linked by friendship, marriage, social status and ideas. Both families had advocated, for instance, for the end of slavery. Charles Darwin and his sister Caroline Darwin both married Wedgwoods too.

Darwin's mother died when he was eight. He grew up watched over by his elder sisters, Marianne Darwin, Caroline Darwin and Susan Darwin. "All were extremely kind and affectionate towards me during their whole lives," he would write in his memoir, published in 1887. Caroline, nine years older and with an interest in botany, tutored him before he left for boarding school, looked after his journals while he was on the Beagle from 1831 to '36, and later critiqued his writing.

Darwin's grandfathers — Erasmus Darwin, a physician, and Josiah Wedgwood, founder of the Wedgwood company — influenced him too. They were both members of the Lunar Society, which met to discuss the latest industrial inventions and scientific experiments.

Erasmus floated his own evolutionary theory, in some ways a precursor to Darwin's. *Zoonomia*; or the Laws of Organic Life (1794–96) is a two-volume work that explores ideas of species competition and sexual selection, among other themes.

4 From an early age, the boy maintained collections of plants and insects; made up stories about his shells, coins and rocks. In his autobiography, he writes: "I was much given to inventing deliberate falsehoods... for the sake of causing excitement... I once gathered valuable fruit from my Father's trees and hid them in the shrubbery, and then ran in breathless haste to spread the news that I had discovered a hoard of stolen fruit."

5 In 1825, Darwin was accepted at Edinburgh University, where his father wished him to study medicine and become a physician. But the surgeries (then often carried out without anaesthetics) traumatised the 16-year-old. When his father proposed that he study to be a priest instead, he joined Christ's College, Cambridge, in 1828 (a degree in Arts was a prerequisite).

There, he struck up a friendship with botany professor John Henslow (who was about 13 years his senior). Soon after Darwin graduated in 1831, it was Henslow who wrote to him, asking if he would like to join Royal Navy commander and scientist Robert FitzRoy, who was captaining the HMS Beagle, on a survey of South America.

6 Darwin, now 22, almost didn't make it onto the ship. His father was deeply averse to the idea. His objections included the idea that the voyage was "disreputable" to the character of a future clergyman, and "a wild scheme" that must have been offered to trained naturalists who declined it; that his accommodations would be uncomfortable, and it would be a "useless undertaking". (It's strange, isn't it, how familiar the arguments seem to anyone who has tried to convince a parent of the merits of a grand adventure?)

7 The Beagle would, of course, be the opportunity of a lifetime. In the five years that Darwin spent studying the zoology and geology of the lands they visited, he unearthed unfamiliar fossils, encountered giant tortoises and marine iguanas that seemed to defy time, collected specimens of strange birds and insects.

Through it all, he maintained an expansive geological diary, several field notebooks, and a diary that later evolved into the famous *Journal of Researches* (1839), later reprinted, over and over, as *The Voyage of the Beagle*.

8 The journey towards his theory of evolution hinged on three primary clues, says Darwin scholar and science historian John van Wyhe. First, the discovery of "great fossil animals covered with armour like that on the existing armadillos" in central Argentina, embedded in which he found mammalian and molluscan remains.

Second, the way in which, as he put it, "closely allied animals replace one another in proceeding southwards over the Continent". And third, the gradual modifications he saw in species across the Galapagos Islands alone, species that were separated only by minor differences in their habitats. "The subject haunted me," he later wrote.

9 Once the Beagle returned to England, he continued his research, sending questionnaires to other scientists voyaging to distant lands, as well as to farmers, livestock breeders and gardeners. He wanted to prove through

direct evidence that a species had been "modified".

He only published *On the Origin of Species* 23 years later, in 1859. Historians have speculated that, even then, he only felt he could because the English naturalist Alfred Wallace had presented a similar theory in an essay the previous year. Some historians suggest he feared being ridiculed, feared persecution, or feared upsetting the social order.

van Wyhe believes there is no truth to this. He points to the first page of *On the Origin of Species*, where Darwin writes that he started working on the theory in 1837, and "from that period to the present day I have steadily pursued the same object".

10 In Wallace, 14 years his junior, Darwin found a protégé, sounding board and friend. Both had spent years studying

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natural history in South America. Wallace's observations impressed Darwin.

According to the Darwin Correspondence Project, an online repository created by University of Cambridge, Wallace trusted Darwin and valued his opinion enough to share with him a draft of his own theory of descent, in 1858.

Soon after, Darwin wrote to the geologist

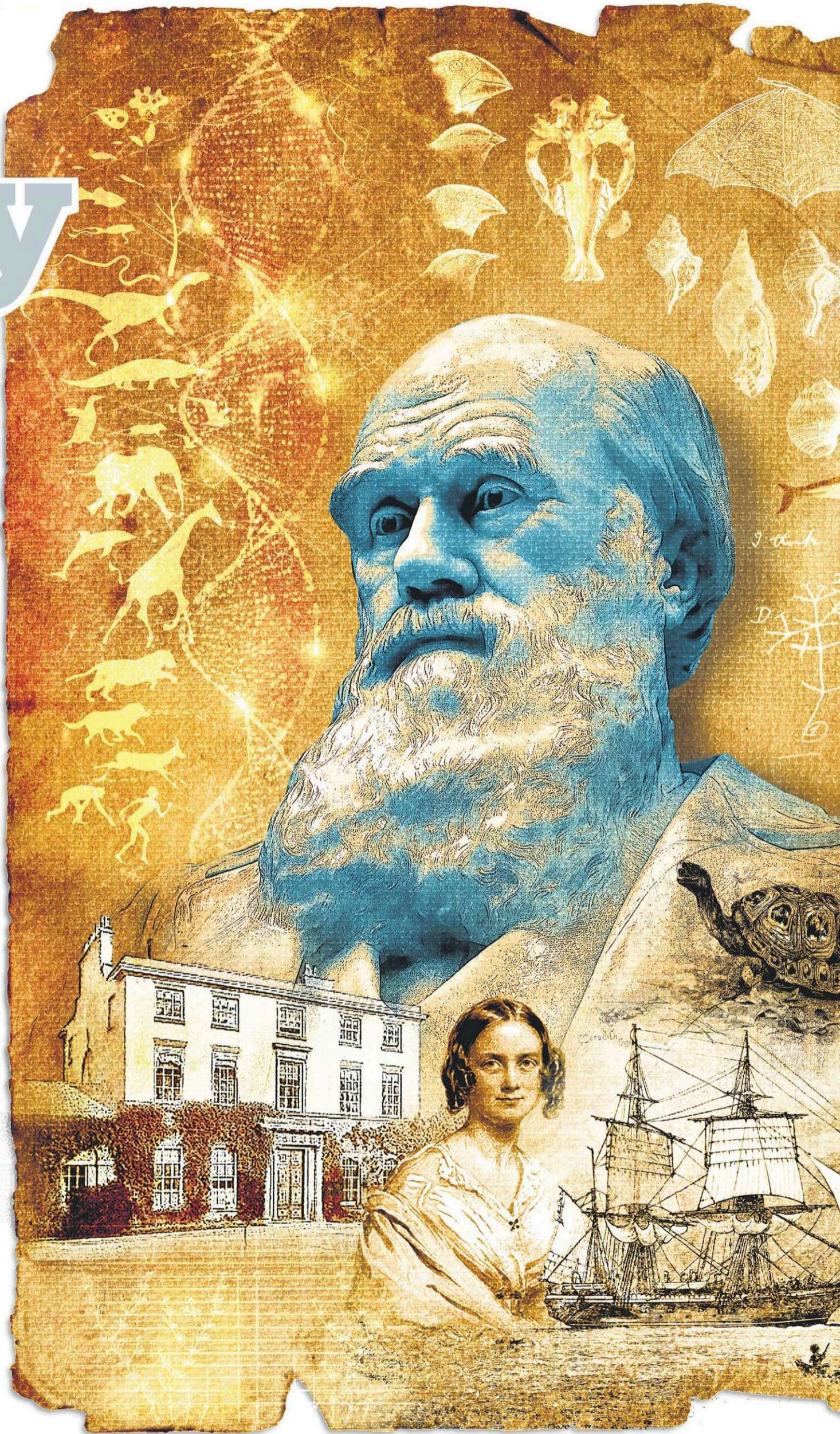
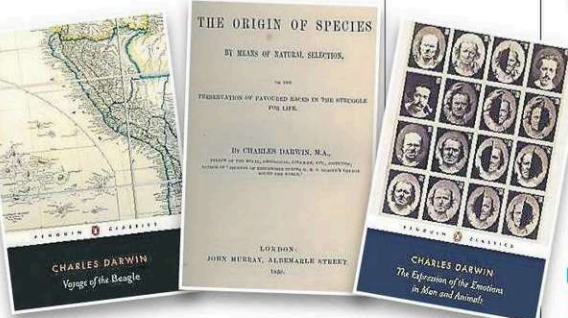
Charles Lyell, "I never saw a more striking coincidence... if Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract!"

The two men presented a joint paper on evolution at the Linnean Society of London meeting that year.

"You are the only man I ever heard of who persistently does himself an injustice & never demands justice," Darwin wrote to Wallace in 1869.

The latter maintained that the theory of natural selection was "actually yours and yours only". "You had worked it out in details I had never thought of, years before I had a ray of light on the subject, & my paper would never have convinced anybody or been noticed as more than an ingenious speculation, whereas your book has revolutionised the study of Natural History, & carried away captive the best men of the present Age," Wallace wrote to Darwin, in 1864.

Spot Darwin's Tree of Life sketch, his childhood home, a tortoise from the Galapagos Islands, the HMS Beagle, and Emma Darwin.



IMAGES: DARWIN ONLINE, GETTY IMAGES; ADOBE STOCK; HT IMAGING; PUNEET KUMAR



READ: An evocative excerpt from the final chapter of Charles Darwin's *On the Origin of Species*

'It was like piecing together a puzzle'



An etching of Darwin's study at Down House in Downe, England, commissioned shortly after his death. DARWIN ONLINE



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John van Wyhe, 52 (below), a science historian and a senior lecturer at National University of Singapore, has been studying Charles Darwin's life, his motivations, books and letters, for three decades.

Since his undergraduate years, it has fascinated van Wyhe that the vast process of evolution was unravelled by this one man, "who was able to question what he was seeing". In 2006,

van Wyhe set up Darwin Online, a comprehensive repository of the naturalist's publications, journals and manuscripts, and writings on him.

This February, to mark his 215th birth anniversary, the website also released a 300-page catalogue that serves as an updated list of the contents of Darwin's personal library. It contains 7,400 titles (an earlier catalogue listed fewer than 1,500).

What continues to intrigue him about Darwin, van Wyhe says, is that centuries ago, he was so curious and open to new ideas that he was able to correct a major error in how we viewed the world, and our place in it. Today, as we grapple with new technology, right-wing fanaticism and a climate emergency, the ability to stay focused on the big picture is something we could draw from him. Excerpts from an interview

What first drew you to Darwin?

When I was about 29 and a doctoral researcher at the University of Cambridge, I read that Darwin kept his theory secret for 20 years and thought that this was so mysterious, fascinating and romantic — this idea that for so many years, this one man knew how life really worked, when no one else did.

This is a scientist who was hands-on with the natural world. At this time, a lot of historians were studying Darwin through his writings and through their readings of that era. But I felt that we were not thinking enough about the natural world that he spent years studying physically.

Retracing his footsteps in Tahiti, for instance, was hugely important to me.

You've said that it took 18 years to reconstruct Darwin's vast personal library...

For the last few decades, Darwin's library was said to consist of about 1,480 books. But we knew that his family gave away many.

Over the years, researchers came upon obscure references in his writings, as well as in notes by his wife, Emma Darwin, to titles that were not among the 1,480. So we knew there were some missing. The trick was to know where to look: in his scribbled notes, in auction catalogues from the past 100 years, in letters written to him or by him.

It felt like piecing together a detective story or a puzzle. Sometimes, we realised his own notes were wrong. For instance, he mentions a title in the catalogue that sounds like an article that turns out to be a chapter in a book. So, we were essentially working with an incomplete puzzle, and often misleading puzzle pieces.

The list now allows anyone with even a passing interest in Darwin to scroll up and down and see just how diverse his resources were. In a way, this helps to fill out the picture of him as a whole human being, rather than just a distant scientist and theorist.

Is there something you believe Darwin's work can bring to conversations today, amid a sixth extinction, climate crisis, AI, war, inequity, growing divisiveness?

A big part of what we know about the natural world, we owe to Darwin. He showed us how to look at the big picture: that living things change over time. I would say that Darwin had a deep perspective of time that is hard for most people to imagine. Life has been going on for so long that compared to that time scale, the problems you've mentioned seem to shrink a bit. We need to be able to take a step back and assess where we're headed in the long run.

I often go back to these words of his from *The Descent of Man, and Selection in Relation to Sex* (1871): "It has often and confidently been asserted, that man's origin can never be known: but ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science."