

Chapter 2: “The Restless Searcher,” in *Charles Darwin and the Evolution Revolution* by Rebecca Steffo, Oxford University Press, 1998

Robert Darwin decided to send Charles to medical school at Edinburgh University in Scotland. Dr. Robert had studied there, and so had Erasmus Darwin, Charles’s grandfather. To Charles’s great delight, his brother, Ras, was also sent to Edinburgh to complete his own medical studies. The two young men arrived in Edinburgh in October 1825, found rooms in a lodging house near the university, warily tasted such Scottish delicacies as fish heads stuffed with oatmeal, and threw themselves into the city’s intellectual life.

Edinburgh was called “the northern Athens” because, like the Athens of ancient Greece, it was a cosmopolitan center of learning. Free thought and new ideas were tolerated there more than in England because Scottish intellectual life was not dominated by religion. Students and teachers at the English universities in Cambridge and Oxford were required to announce their belief in the state religion, the Church of England, which was not only one of the pillars of the English monarchy but also a powerful unifying force in society. In England, the church discouraged speculation about the age of the earth or the history of living

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things, claiming that such matters were properly explained by the Bible, not by science. But students and teachers in Scotland were not bound by an official religion. Furthermore, Scotland had long had close cultural and political ties with France, home of some of the most innovative philosophers and scientists of the 18th century, and Edinburgh’s intellectual life was enriched by the presence of teachers from Paris and elsewhere in Europe.

Edinburgh, with its free-thinking atmosphere, was a hotbed of activity in geology, the study of the earth, and biology, the study of life. Physicians, writers, philosophers, and naturalists from all over Great Britain, Europe, and even the United States gathered in Edinburgh. To the end of his life Charles Darwin remembered seeing the American naturalist John James Audubon, dressed in the rough clothes of a backwoodsman, with his black hair streaming over his collar, demonstrating the proper way to mount a stuffed bird. All in all, Edinburgh was a heady, stimulating place for a young man beginning to explore the world of ideas and science. The two Darwins attacked their studies with zeal.

During their first term, they took more books out of the university library than any other students; they also bought books with their generous allowance from Dr. Robert. Their enthusiasm, however, did not last long. Charles complained that the lectures were painfully dull, but far greater

horrors awaited him in the operating rooms. In the days before painkilling anesthetics, surgery was performed on patients who were strapped to their beds, often conscious and terrified, with buckets of sawdust on hand to absorb the blood. The medical students were expected to watch operations, but Charles was unable to stand the sight of the blood and the screams of the patients. He tried twice, but after viewing an especially gruesome operation on a child he fled the room, never to return. Although later in life he was sorry that he had never properly learned the art of dissection, which would have been useful to him in his scientific

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studies, he never overcame his dread of blood and pain. Charles was happy when the school year ended. He spent the summer visiting his Wedgwood cousins and other friends, and enjoying all his favorite hobbies. He was so fond of hunting and shooting that, as he later recalled, he kept his hunting boots ready by his bed “so as not to lose half a minute in putting them on in the morning.” In later years, though, he lost his pleasure in shooting. “I discovered,” he explained, “that the pleasure of observing & reasoning was a much higher one than that of skill & sport.” Ras did not return to Edinburgh after that first year; instead, he went to London to finish his medical degree. Charles believed that Ras would never practice medicine, and events proved him right. Dr. Robert decided that Ras’s health was too delicate to allow him to work, so Ras settled into a life of comfortable leisure in London, where he pursued friendships with leading literary and scientific figures. Charles prepared to go back to Edinburgh for his second year of medical school, although he had begun to suspect that he, too, might never become a doctor. He knew that he would inherit a substantial sum from his father, who had grown rich by investing in land. The knowledge that he would have plenty of money to live on and would not need to worry about supporting himself as a physician made medical school less appealing than ever. During his second year at Edinburgh, he devoted more energy to natural history than to medicine.

In 1826, Charles joined the Plinian Society, a club for men interested in natural history. At the society’s meetings, long-established notions were hotly challenged by daring new ideas. In religious terms, the debate was between orthodox, or traditional, thinking and heretical, or radical, thinking. Orthodox thinkers—by far the majority in science and in society at large—accepted the Bible as the literal truth. They believed that the world had been shaped by God through miracles and supernatural forces, such as

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divine creation and Noah's great flood. The heretics, on the other hand, rejected supernatural and divine explanations for things. Science, they insisted, could explain the world in terms of understandable physical forces—natural forces such as chemical reactions and gravity. The radical thinkers also claimed that man was part of the natural world, not a special creation standing apart from it.

Conservative, orthodox thinkers were frightened and angered by those who questioned the traditional view of the world. They called the new ideas mechanistic because they felt that the radical view of life reduced man to a mere mechanism without a soul. The traditionalists also feared that the new ideas might tear apart the fabric of society, which was held together by the church. Look what had happened in France, they warned: Free thought and radical ideas had run wild during the 18th century, encouraging the lower classes to question the established order of things—and the century had ended with the bloody French Revolution.

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Plinian Society meetings were frequently enlivened by arguments between traditional and radical thinkers—arguments that ranged over politics, philosophy, and religion as well as scientific questions. At the first meeting Darwin attended, for example, a member named William Browne criticized a new book that claimed that God had given humans special muscles so that people could smile, frown, and laugh. Browne declared that this was nonsense. Humans and animals, he argued, had the same kinds of muscles—a most heretical, radical notion. Darwin's contribution to science must be viewed against the background of the great struggle of ideas that was raging in the scientific world as he came of age. Darwin was deeply troubled by the conflict between old and new ideas; he held back from making his ideas public, even when he was convinced that they were sound, because he knew that they would cause an uproar and he hated to be the center of controversy. In another way, though, this struggle of ideas helped Darwin by providing a fertile environment in which his mind could be stimulated. Like all great thinkers, Darwin was influenced by the work of other people. His brilliant insights into the nature of living things were shaped, in part, by the books and scientific papers that were published in his day and by the discussions and debates they sparked. Darwin was not a lone visionary on a mountaintop, grasping truths that no one else had seen; he was a product of his time, and his ideas grew out of the intellectual climate in which he lived. Today, Darwin is remembered as the founder of the theory of evolution, but ideas about evolution had been discussed for years before

Darwin came along. It happened, however, that Darwin brought his rare intellect to science at a particularly fruitful time.

For centuries, Western thought had been based on the Bible, which says that God created the earth and everything on it in six days. This creation, moreover, was supposed to

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have happened just a few thousand years earlier. In the 17th century many scholars, including the English mathematician Isaac Newton, added up all the generations named in the Bible and decided that the earth had been created four or five thousand years before the birth of Christ. Archbishop James Ussher of Armagh, Ireland, concluded that creation had occurred in 4004 B.C., a date that became famous because it was printed in so many Bibles that most people, including Charles Darwin, thought it was part of the original biblical text.

By Darwin's time, many observant and thoughtful people had questioned the biblical account of creation. The first challenge came from geology. Fossils—rocks that bore an uncanny resemblance to shells and other living things—had long been a source of mystery. What were they, and where did they come from? It was once thought that fossils were simply rocks that happened by coincidence to be shaped like plants and animals. By the 18th century, however, geologists had realized that fossils were the actual relics of once-living things. But how could they have turned to stone in just a few thousand years?

The mystery deepened when people began unearthing fossils that clearly bore no relation to any living creatures. The most spectacular were the fossils of dinosaurs, the first of which was discovered by an English couple named Gideon and Mary Ann Mantell in 1822. Soon more dinosaur fossils were found, and they captured the public imagination with their great size and strangeness. It became obvious that the earth had once been home to forms of life that no longer existed. But how could this be, if, as orthodox thinkers claimed, God had created each species in its final form once and for all time? Orthodox Christians met this challenge by claiming that the extinct creatures had drowned in the great flood described in the Bible. For example, Robert FitzRoy, captain of the *Beagle*, believed that mammoths had become extinct because they were too

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large to fit into the doorway of Noah's ark. This is why 19th-century writers often described dinosaurs, mammoths, and other extinct animals as "antediluvian" (which means "before the deluge," or flood).

A theory called catastrophism held that the earth's history

had consisted of a series of catastrophes, or sudden, devastating events, such as worldwide floods, volcanic eruptions, and earthquakes. According to the catastrophists, every aspect of the earth's appearance, from mountains to canyons, resulted from a past catastrophe. Catastrophism explained why fossils of seashells were sometimes found on mountaintops far from the sea: They had been washed there by floods. The religious version of catastrophism held that God had created and destroyed the world many times, and that the creation described in the Bible was only the most recent one. The dinosaurs and other extinct animals belonged to earlier creations and had perished in the destruction that preceded each new creation.

A rival theory about the earth's history emerged in the late 18th century. In 1788, a Scottish intellectual named James Hutton (1726–97) published a long scientific paper called "Theory of the Earth"; it was reissued as a book in 1795. Hutton claimed that the present state of the earth could best be explained not by immense, dramatic convulsions in the past, but by the slow, steady action of familiar forces over a very long period of time. According to Hutton, the earth was shaped by these gradual processes. Rivers deposited silt to form new layers of soil; seas slowly dried up, and over thousands of years their beds were pushed up into mountain ranges, complete with fossil shells. Because Hutton said that geological processes took place at a steady, uniform rate rather than in a series of catastrophic lurches, his theory was called uniformitarianism.

Uniformitarianism made the earth much older than anyone had previously believed. Hutton's earth-shaping  
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processes would have needed thousands upon thousands of years to do their job. Summing up his view of geological history, Hutton wrote, "The result, therefore, of our present enquiry is, that we find no vestige of a beginning—no prospect of an end."

This view of the earth's history as stretching far back into an unimaginably ancient past confused and disturbed people who were accustomed to thinking of history in brief, biblical terms. As Hutton's friend John Playfair wrote in 1802, "The mind seemed to grow giddy by looking so far into the abyss of time." Yet by the 1820s uniformitarianism was gaining ground because it explained features of geology that catastrophism could not explain.

Today geologists know that *both* uniformitarianism and catastrophism are true. Geological changes take place slowly and over long periods of time, as when rainfall erodes a mountain range a little at a time or a glacier grinds forward at a snail's pace, but sudden cataclysms such as floods and volcanic eruptions also have helped to shape the earth. In

Darwin's day, however, the vision of uniformitarianism—the unfolding of the millions of past years that geologists call “deep time”—was considered revolutionary. A few years after Darwin left Edinburgh, he would be profoundly influenced by an important new book that supported Hutton's vision of deep time.

While geologists were delving into the distant past, biologists were challenging the orthodox notions about life. Traditionally, the forms of living things had been viewed as fixed and unchanging. Both religion and natural history arranged the various species neatly in a ladder of life. At the bottom of the ladder were “low” creatures such as earthworms and insects. Reptiles, birds, and mammals occupied ever-higher rungs. Humans were perched at the very pinnacle of the ladder, right below the angels.

To those who believed in the biblical view of life, the orderliness and structural perfection of nature seemed to

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prove that God had created the natural world. This idea is called the “argument from design,” or the “watchmaker argument.” In his 1802 book *Natural Theology*, Bishop William Paley outlined the argument: Suppose you were out walking and came upon a pocket watch. You had never seen a watch before. Seeing that the watch was a precise, intricate mechanism, you would conclude that it could not simply have happened at random. It must have been designed and made by a watchmaker. The eye, like the pocket watch, is a delicate, intricate mechanism. It is so perfect that it, too, must have been designed, and its designer was God. In his youth Darwin was “charmed and convinced” by Paley's argument. Later in his career, however, he pointed out its weaknesses.

New discoveries and ideas kept casting fresh doubt on the notion that each species had been created by God in a perfect, permanent form. What about the extinct species? If they were perfect, why did they disappear? And what about the new kinds of plants and animals that explorers were finding in Africa, Australia, and the Americas? These were not mentioned in the Bible. Had God performed a separate act of creation for each continent? A few scholars, seeing how easily farmers and stock breeders created new varieties of fruit, flowers, and poultry, realized that species were fluid and changeable, not fixed and unchanging. Darwin's own grandfather, Erasmus Darwin, had this insight. So did Jean-Baptiste Lamarck (1744–1829), a French zoologist-philosopher who wrote that species adapt, or change, to fit their environment. But Lamarck could not convincingly describe *how* these changes took place.

Charles Darwin was exposed to the theories of Lamarck and of his grandfather while he was in Edinburgh,

but he does not seem to have been very much impressed by them. (Throughout his career Darwin insisted, not altogether convincingly, that his own work had not been influenced by Erasmus Darwin's writings. Scholars are still

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studying the relationship between the two men's ideas.) The teenage Darwin was far from being an evolutionist. In his autobiography, he claimed that in the 1820s he still believed in "the strict and literal truth of every word in the Bible."

At that time, Darwin had not begun to think about the big picture of life on earth. He was still entranced by its tiny, fascinating details.

He spent hours studying the stuffed birds in the university's natural history museum or hiking over cliffs and hills, poking at rocks and trying to piece together the local geology. With friends from the Plinian Society, he made expeditions along the seashore; they waited until the tide was far out to scour the sands for sponges, sea pens, and other small creatures washed up from the deep. Sometimes when the fishermen took their trawlers out to dredge for oysters, Darwin accompanied them and squatted on the slippery decks while he sifted through their haul for sea slugs. In March 1827 he proudly reported to the Plinian Society several discoveries he had made concerning the structure of microscopic sea organisms.

Darwin spent the summer of 1827 traveling and relaxing. He made his first visit to London, which he called a "horrid smoky wilderness." Together with his uncle Josiah Wedgwood II and his cousins Emma and Fanny, he made his first and only trip to the European continent, spending several weeks in Paris. But the question of his future weighed heavily upon him. He was restless and tired of medical school, where he had not done well in his classes. Dr. Robert realized that Charles had no desire to become a doctor, but he felt that the boy should have *some* position in society. Although Dr. Robert was not a religious man, he knew that the Church of England (also called the Anglican Church) provided a secure and respectable way of life for its clergymen. He decided that Charles should enter the church.

"Considering how fiercely I have been attacked by the

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orthodox," Darwin wrote late in life, "it seems ludicrous that I once intended to be a clergyman." Darwin would find himself at odds with the church in the 1850s, but in 1827 he was happy to agree to his father's new plan. Although he did not have strong religious feelings, he was aware that the life of a country clergyman offered considerable leisure in which he could pursue his interest in natural

history. In fact, many of the leading naturalists of the day were clergymen, for science was not yet established as a profession in its own right, and it was almost impossible to earn a living through scientific work alone.

But before Darwin could become a clergyman-naturalist, he needed more education. He enrolled in Christ's College at Cambridge and found to his dismay that he had to hire a tutor to refresh his knowledge of the Greek and Latin he had paid so little attention to at Shrewsbury School. His exams were grueling, and each one threw Darwin into a panic, although by studying furiously he managed to pass them all.

Cambridge offered a lively social life to a young man with pocket money and a friendly disposition. Darwin drifted into what he called "a sporting set," a group of young men who enjoyed riding and shooting. Later he looked back fondly on their lively dinner parties, which featured "jolly singing and playing at cards afterwards." He wrote sheepishly, "I know that I ought to feel ashamed of days and evenings thus spent, but as some of my friends were very pleasant, and we were all in the highest spirits, I cannot help looking back to those times with much pleasure."

Studying and revelry did not take up all of Darwin's time. His interest in natural history had a new focus: beetles. He and his cousin William

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Darwin Fox, also a student at Christ's College, became obsessed with beetle hunting, which they called "beetling." Darwin went to great lengths to secure new specimens. He paid a local laborer to gather water beetles from the bottoms of riverboats—and fired him indignantly when he learned that the man had turned the best specimens over to a rival collector in exchange for a bribe.

On one beetling expedition, Darwin saw two rare beetles and seized one in each hand. Then he saw a third species. Unwilling to let any of them escape, he popped the beetle in his right hand into his mouth so that he could grab the new specimen. The beetle in his mouth reacted by squirting out a vile, bitter fluid. Appalled, Darwin spat out his victim, and in the confusion he lost the third beetle as well. On another outing he captured a beetle that brought him better luck. It turned out to be a new species, and a scientific journal gave Darwin credit for capturing the first known specimen. Decades later, the world-renowned Darwin called that modest early triumph "the proudest moment of my life."

At Cambridge, Darwin got to know two influential clergymen-scientists, the botanist John Stevens Henslow and the geologist Adam Sedgwick. Darwin learned much about plants and insects from Henslow; the two spent so much time walking in the Cambridge countryside that Darwin was identified as “the man who walks with Henslow.” Later Darwin was to say that his friendship with Henslow was the most important influence on his entire career. Sedgwick, too, broadened Darwin’s intellectual horizons by teaching him about field geology. Darwin was impressed by the older man’s ability to read the earth’s history from the rocks. Listening to Sedgwick, he suddenly saw science in a new way. A scientist, Darwin realized, must do more than just record facts; he must also search for patterns of meaning. “Nothing before had ever made me thoroughly realise, though I had read various scientific books, that science con-

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sists in grouping facts so that general laws or conclusions may be drawn from them,” Darwin wrote of one field trip with Sedgwick.

Darwin’s final examinations were scheduled for January 1831. Study and anxiety made him miserable for weeks beforehand, but when the results were posted, he ranked 10th in a class of 178. Jubilantly, with his degree in hand, he set off on a geological expedition to Wales with Sedgwick, then returned to The Mount to spend the summer with his father and sisters.

At the age of 22, Charles Darwin was a healthy, vigorous young man, just under six feet tall. His brown eyes were deeply set under a high, bulging forehead; his light brown hair was thin and short, but his side-whiskers were fashionably long and bushy. A mild, easygoing fellow, he seemed headed straight for the placid life of a country clergyman. Then, on August 29, 1831, he received a letter that changed the course of his life.

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