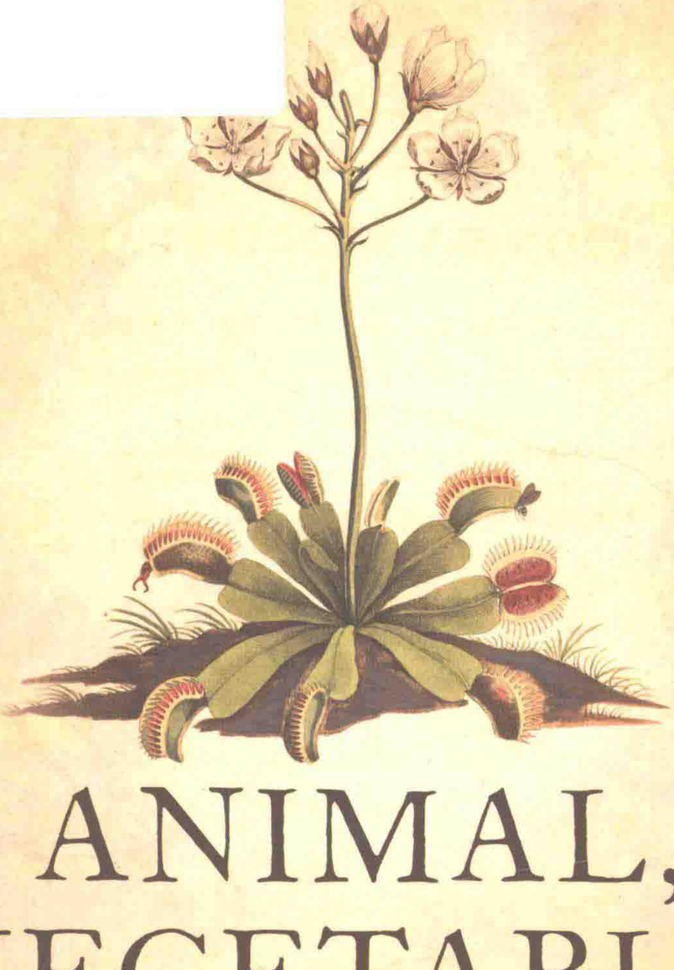

ANIMAL, VEGETABLE, MINERAL?

How eighteenth-century science disrupted the natural order

SUSANNAH GIBSON

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For Philomena and John

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What is this earth and sea of which I have seen so much?
Whence is it produc'd? And what am I and all the other creatures,
wild and tame, humane and brutal? Whence are we?

Daniel Defoe, Robinson Crusoe, 1719

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Animal, Vegetable, Mineral?

Animal, vegetable, or mineral: today, this is a simple parlour game for children but in the eighteenth century it was a problem that exercised some of the finest minds of Europe. The question of distinguishing animal from plant from mineral may seem like a straightforward one but in fact it can very quickly lead to incredibly complex problems: how do we differentiate the kingdoms? are there different kinds of life? how does generation of life occur? What *is* life? It may be an easy task to say that an elephant is an animal while an oak tree is a plant, but what is a sponge, a coral, a Venus fly-trap, a fossil? These curious objects seem to combine properties from across the animal, vegetable, and mineral kingdoms and blur the lines between them. Today, we have developed an agreed set of rules for establishing an object's kingdom, but it wasn't always so. The problem really came to a head in the eighteenth century: this was a time when some very strange creatures became known to naturalists; when better tools like microscopes enabled naturalists to make more minute examinations of natural objects; when a classification craze was sweeping across Europe; and when Enlightenment culture was encouraging people to rethink old ideas. This combination of factors led naturalists to ask hard questions about how we know whether or not something is alive, and what kind of life it possesses. These questions—so fundamental, yet so complicated—puzzled men of science. In the wider world, their answers had the power to incite tremendous controversy about the role of God in the universe and about the natural order of society.

The eighteenth century was a time of Enlightenment, of empire, and of industrialization. Social, political, economic, and scientific changes were happening at a faster pace than ever before. Agricultural societies became urban societies, farm labourers became factory employees, new wealth was created and distributed in different ways, Enlightenment ideas began to roll out of Germany and France to reshape the intellectual landscape of all Europe, empires expanded their reach into ever-further corners of the globe, and revolutionary ideas began to ferment. These changes were intricately interlinked, each having complex and unforeseen repercussions across society. Naturally, they were also keenly felt by the scientific community of the day. Increased exploration and the expansion of European empires brought Europeans into contact with peoples they had never met before, with new terrains, new languages, new customs, and, of course, new species of plants and animals. The mass move from rural to urban settings changed man's relationship with, and view of, nature. New wealth allowed some groups more leisure time, and made scientific books and instruments more accessible to a larger section of society. Industrialization necessitated new technologies and fostered bold innovations. The Enlightenment movement encouraged learning and rational discourse, and opened the scientific world to new audiences. And revolutionary sentiments allowed people to question traditional beliefs about God, society, and nature.

This colourful century saw the creation of everything from the piano to the steam engine, steel to the smallpox vaccination. Simultaneous European discoveries of new celestial bodies in our solar system and of remote Pacific islands showed how much of the world was still to be explored and how many questions about the natural world were still unanswered. The search for these answers was set against the backdrop of the music of Bach and Mozart, the poetry of Pope and Goethe, the philosophies of Kant and Rousseau, the inventions of Watt and Newcomen, the teachings of Smith and Hume, the courts of the Hanoverians and the Bourbons, the revolutionary zeal of Washington and Robespierre, the writings of Casanova and Swift. The eighteenth century was an exciting time not just for music, literature, or politics, but also for the sciences: Isaac Newton's work on gravity, motion, optics, and calculus had inspired new generations to devote themselves to the study of physics and mathematics; demonstrations of the dazzling new science of electricity attracted hundreds of spectators; chemistry, sometimes just as spectacular as electricity, was unearthing new elements at an astonishing rate; astronomy, powered by ever-more sophisticated telescopes, caught the public imagination as high-profile astronomers tracked the transit of Venus or discovered new planets like distant Uranus; the life sciences exploded as strange new creatures were brought back to Europe from distant lands and tales of heroic exploration abounded.

This vibrant scientific milieu was the perfect breeding ground for hard questions about how the world worked. Men of science, particularly naturalists who focused on studying the animal, vegetable, and mineral kingdoms, strove to uncover the secrets of nature.[1] One of the most basic questions for a naturalist was: how were the natural kingdoms arranged? Had God imposed a particular order on them, clearly separating animal from vegetable? If so, how could humans begin to make sense of this order and find workable definitions of the different kingdoms? Or was it possible, as some were beginning to suggest, that there were no clear-cut boundaries between the natural kingdoms and that God was far less involved in the regulation of nature than previously believed? The stories in this book—which feature strange creatures like Abraham Trembley's somersaulting polyps, Lazzaro Spallanzani's smartly trousered frogs, or Jean André Peyssonnel's blossoming corals—show how apparently straightforward investigations into particular species could quickly spiral into complex and nuanced philosophical debates about the very meaning of life. But before we meet these eighteenth-century luminaries of the life sciences, we must understand the developments that led to their work.

Aristotle's animals

It is impossible to understand eighteenth-century life sciences without an appreciation for the work of one central figure: Aristotle. More than anyone else, this man shaped the study of nature. From his own lifetime in the fourth century BC right up until the time of Charles Darwin in the nineteenth century, Aristotle's teachings were considered of primary importance to any student of the natural world. Every character who appears in this book had read Aristotle's animal writings, and so it seems appropriate to start where they started—with an understanding of Aristotle.

Aristotle was born in 384 BC in the northern Greek town of Stagira to a wealthy and well-educated family. His father,