The Age of Wonder

How the Romantic Generation Discovered the Beauty and Terror of Science

Richard Holmes

Published by HarperPress

Extract

To Jon Cook at Radio Flatlands

Harper*Press*
An imprint of HarperCollins*Publishers*
77–85 Fulham Palace Road
Hammersmith
London W6 8JB

Visit our authors' blog at www.fifthestate.co.uk
Love this book? www.bookarmy.com

This Harper*Press* paperback edition published 2009
1

First published in hardback in Great Britain by Harper*Press* in 2008

A catalogue record for this book is available from the British Library

ISBN 978-0-00-714953-7

Set in Minion by
Newgen Imaging System (P) Ltd, Chennai, India

Printed and bound in Great Britain by Clays Ltd, St Ives plc

Two things fill my mind with ever new and increasing wonder and awe, the more often and persistently I reflect upon them: the starry heaven above me and the moral law within me...I see them in front of me and unite them immediately with the consciousness of my own existence.

Immanuel Kant, *Critique of Practical Reason* (1788)

He thought about himself, and the whole Earth,
Of Man the wonderful, and of the Stars,
And how the deuce they ever could have birth;
And then he thought of Earthquakes, and of Wars,
How many miles the Moon might have in girth,
Of Air-balloons, and of the many bars
To perfect Knowledge of the boundless Skies;
And then he thought of Donna Julia's eyes.

Byron, *Don Juan* (1819), Canto 1, stanza 92

Those to whom the harmonious doors
Of Science have unbarred celestial stores…

William Wordsworth, 'Lines Additional to an Evening Walk' (1794)

Nothing is so fatal to the progress of the human mind as to suppose our views of science are ultimate; that there are no mysteries in nature; that our triumphs are complete; and that there are no new worlds to conquer.

Humphry Davy, lecture (1810)

I shall attack Chemistry, like a Shark.

Samuel Taylor Coleridge, letter (1800)

… Then felt I like some watcher of the skies
When a new planet swims into his ken;
Or like stout Cortez when with wond'ring eyes
He stared at the Pacific…

John Keats, ms of sonnet (1816)

To the natural philosopher there is no natural object unimportant or trifling… a soap bubble… an apple… a pebble… He walks in the midst of wonders.

John Herschel, *A Preliminary Discourse on the Study of Natural Philosophy* (1830)

Yes, there is a march of Science, but who shall beat the drums of its retreat?

Charles Lamb, shortly before his death (1834)

Prologue

1

In my first chemistry class, at the age of fourteen, I successfully *precipitated* a single crystal of mineral salts. This elementary experiment was done by heating a solution of copper sulphate (I think) over a Bunsen burner, and leaving it to cool overnight. The next morning there it lay at the bottom of my carefully labelled test tube: a single beautiful crystal, the size of a flattened Fox's Glacier Mint, a miniature ziggurat with a faint blue opalescence, propped up against the inside of the glass (too big to lie flat), monumental and mysterious to my eyes. No one else's test tube held anything but a few feeble grains. I was triumphant, my scientific future assured.

But it turned out that the chemistry master did not believe me. The crystal was too big to be true. He said (not at all unkindly) that I had obviously faked it, and slipped a piece of coloured glass into the test tube instead. It was quite a good joke. I implored him, 'Oh, test it, sir; *just test it!*' But he refused, and moved on to other matters. In that moment of helpless disappointment I think I first glimpsed exactly what real science should be. To add to it, years later I learned the motto of the Royal Society: *Nullius in Verba* – 'Nothing upon Another's Word'. I have never forgotten this incident, and have often related it to scientific friends. They nod sympathetically, though they tend to add that I did not (as a matter of chemical fact) *precipitate* a crystal at all – what I did was to *seed* one, a rather different process. No doubt this is so. But the eventual consequence, after many years of cooling, has certainly been to precipitate this book.

2

The Age of Wonder is a relay race of scientific stories, and they link together to explore a larger historical narrative. This is my account of the second scientific revolution, which swept through Britain at the end of the eighteenth century, and produced a new vision which has rightly been called Romantic science.[1]

Romanticism as a cultural force is generally regarded as intensely hostile to science, its ideal of subjectivity eternally opposed to that of scientific objectivity. But I do not believe this was always the case, or that the terms are so mutually exclusive. The notion of *wonder* seems to be something that once united them, and can still do so. In effect there is Romantic science in the same sense that there is Romantic poetry, and often for the same enduring reasons.

The first scientific revolution, of the seventeenth century, is familiarly associated with the names of Newton, Hooke, Locke and Descartes, and the almost simultaneous foundations of the Royal Society in London and the Académie des Sciences in Paris. Its existence has long been accepted, and the biographies of its leading figures are well known.♣ But this second revolution was something different. The first person who referred to a 'second scientific revolution' was probably the poet Coleridge in his *Philosophical Lectures* of 1819.[2] It was inspired primarily by a sudden series of breakthroughs in the fields of astronomy and chemistry. It was a movement that grew out of eighteenth-century Enlightenment rationalism, but largely transformed it, by bringing a new imaginative intensity and excitement to scientific work. It was driven by a common ideal of intense, even reckless, personal commitment to discovery.

It was also a movement of transition. It flourished for a relatively brief time, perhaps two generations, but produced long-lasting consequences – raising hopes and questions – that are still with us today. Romantic science can be dated roughly, and certainly symbolically, between two celebrated voyages of exploration. These were Captain James Cook's first round-the-world expedition aboard the *Endeavour*, begun in 1768, and Charles Darwin's voyage to the Galapagos islands aboard the *Beagle*, begun in 1831. This is the time I have called the *Age of Wonder*, and with any luck we have not yet quite outgrown it.

The idea of the exploratory voyage, often lonely and perilous, is in one form or another a central and defining metaphor of Romantic science. That is how William Wordsworth brilliantly transformed the great

♣ The fine survey by Lisa Jardine, *Ingenious Pursuits: Building the Scientific Revolution* (1999), gives a vivid picture of the leading figures in the seventeenth-century scientific revolution across Europe, and includes a significant introductory essay on the emerging role of science in modern society. See also my bibliography, 'The Bigger Picture', page 485.

Enlightenment image of Sir Isaac Newton into a Romantic one. While a university student in the 1780s Wordsworth had often contemplated the full-size marble statue of Newton, with his severely close-cropped hair, that still dominates the stone-flagged entrance hall to the chapel of Trinity College, Cambridge. As Wordsworth originally put it, he could see, a few yards from his bedroom window, over the brick wall of St John's College,

> The Antechapel, where the Statue stood
> Of Newton, with his Prism and silent Face.

Sometime after 1805, Wordsworth animated this static figure, so monumentally fixed in his assured religious setting. Newton became a haunted and restless Romantic traveller amidst the stars:

> And from my pillow, looking forth by light
> Of moon or favouring stars, I could behold
> The Antechapel where the Statue stood
> Of Newton, with his prism and his silent face,
> The marble index of a Mind for ever
> Voyaging through strange seas of Thought, alone.[3]

Around such a vision Romantic science created, or crystallised, several other crucial conceptions – or misconceptions – which are still with us. First, the dazzling idea of the solitary scientific 'genius', thirsting and reckless for knowledge, *for its own sake and perhaps at any cost*. This neo-Faustian idea, celebrated by many of the imaginative writers of the period, including Goethe and Mary Shelley, is certainly one of the great, ambiguous creations of Romantic science which we have all inherited. Closely connected with this is the idea of the 'Eureka moment', the intuitive inspired instant of invention or discovery, for which no amount of preparation or preliminary analysis can really prepare. Originally the cry of the Greek philosopher Archimedes, this became the 'fire from heaven' of Romanticism, the other true mark of scientific genius, which also allied it very closely to poetic inspiration and creativity. Romantic science would seek to identify such moments of singular, almost mystical vision in its own history. One of its first and most influential examples was to become the story of the solitary, brooding Newton in his orchard, seeing an apple fall and 'suddenly' having his vision of universal gravitation. This story

was never told by Newton at the time, but only began to emerge in the mid-eighteenth century, in a series of memoirs and reminiscences.♣

The notion of an infinite, mysterious Nature, waiting to be discovered or seduced into revealing all her secrets, was widely held. Scientific instruments played an increasingly important role in this process of revelation, allowing man not merely to extend his senses passively – using the telescope, the microscope, the barometer – but to intervene actively, using the voltaic battery, the electrical generator, the scalpel or the air pump. Even the Montgolfier balloon could be seen as an instrument of discovery, or indeed of seduction.

There was, too, a subtle reaction against the idea of a purely mechanistic universe, the mathematical world of Newtonian physics, the hard material world of objects and impacts. These doubts, expressed especially in Germany, favoured a softer 'dynamic' science of invisible powers and mysterious energies, of fluidity and transformations, of growth and organic change. This is one of the reasons that the study of electricity (and chemistry in general) became the signature science of the period; though astronomy itself, once the exemplary science of the Enlightenment, would also be changed by Romantic cosmology.

The ideal of a pure, 'disinterested' science, independent of political ideology and even religious doctrine, also began slowly to emerge. The emphasis on a secular, humanist (even atheist) body of knowledge, dedicated to the 'benefit of all mankind', was particularly strong in Revolutionary France. This would soon involve Romantic science in new kinds of controversy: for instance, whether it could be an instrument of the state, in the case of inventing weapons of war. Or a handmaiden of the Church, supporting the widely held view of 'Natural theology', in which science reveals evidence of a divine Creation or intelligent design.

♣ The apple fell in his orchard at Woolsthorpe, Lincolnshire, where Newton, aged twenty-five, had retired from Cambridge during the Plague of 1665. Various versions of the story began to appear after his death in 1727. It appears in Stukeley's unpublished Memoir of Newton, originally written in 1727, but not given to the Royal Society in manuscript until 1752; in unpublished notes for a biography by his nephew John Conduit; and for the first time in print in Voltaire's *Letters on the English Nation* (1734). Part of the power of the story was that it replaced the sacred Biblical account of the Fall from Innocence in Genesis (Eve and the apple) with a secular parable of the Ascent to Knowledge. See Patricia Fara, *Newton: The Making of Genius* (2005); and for a broad visionary perspective, Jacob Bronowski's scientific classic *The Ascent of Man* (1973).

With these went the new notion of a popular science, a people's science. The scientific revolution of the late seventeenth century had promulgated an essentially private, elitist, specialist form of knowledge. Its *lingua franca* was Latin, and its common currency mathematics. Its audience was a small (if international) circle of scholars and *savants*. Romantic science, on the other hand, had a new commitment to explain, to educate, to communicate to a general public.

This became the first great age of the public scientific lecture, the laboratory demonstration and the introductory textbook, often written by women. It was the age when science began to be taught to children, and the 'experimental method' became the basis of a new, secular philosophy of life, in which the infinite wonders of Creation (whether divine or not) were increasingly valued for their own sake. It was a science that, for the first time, generated sustained public debates, such as the great Regency controversy over 'Vitalism': whether there was such a thing as a life force or principle, or whether men and women (or animals) had souls.

Finally, it was the age which challenged the elite monopoly of the Royal Society, and saw the foundation of scores of new scientific institutions, mechanics institutes and 'philosophical' societies, most notably the Royal Institution in Albemarle Street in 1799, the Geological Society in 1807, the Astronomical Society in 1820, and the British Association for the Advancement of Science in 1831.

Much of this transition from Enlightenment to Romantic science is expressed in the paintings of Joseph Wright of Derby. Closely attached to the Lunar Society, and the friend of Erasmus Darwin and Joseph Priestley, Wright became a dramatic painter of experimental and laboratory scenes which reinterpreted late-eighteenth-century Enlightenment science as a series of mysterious, romantic moments of revelation and vision. The calm, glowing light of reason is surrounded by the intense, psychological chiaroscuro associated with Georges de la Tour. This is most evident in the famous series of scientific demonstration scenes painted at the height of his career: *The Orrery* (1766, Derby City Museum and the frontispiece of this book), *The Air Pump* (1767, National Gallery, London) and *The Alchemist* (1768, Derby City Museum). But these memorable paintings also ask whether Romantic science contained terror as well as wonder: if discovery and invention brought new dread as well as new hope into the world. We have certainly inherited this dilemma.

The Age of Wonder aims to raise and reflect upon such questions. Yet in the end the book remains a narrative, a piece of biographical story-telling. It tries to capture something of the inner life of science, its impact on the heart as well as on the mind. In the broadest sense it aims to present scientific passion, so much of which is summed up in that child-like, but infinitely complex word, *wonder*. Plato argued that the notion of 'wonder' was central to all philosophical thought: 'In Wonder all Philosophy began: in Wonder it ends...But the first Wonder is the Offspring of Ignorance; the last is the Parent of Adoration.'[4]

Wonder, in other words, goes through various stages, evolving both with age and with knowledge, but retaining an irreducible fire and spontaneity. This seems to be the implication of Wordsworth's famous lyric of 1802, which was inspired not by Newton's prism, but by Nature's:

> My heart leaps up when I behold
> A rainbow in the sky;
> So was it when my life began;
> So is it now I am a man;
> So be it when I shall grow old,
> Or let me die!...[5]

This book is centred on two scientific lives, those of the astronomer William Herschel and the chemist Humphry Davy. Their discoveries dominate the period, yet they offer two almost diametrically opposed versions of the Romantic 'scientist', a term not coined until 1833, after they were both dead. It also gives an account of their assistants and protégés, who eventually became much more than that, and handed on the flame to the very different world of professional Victorian science. But it draws in many other lives, and it is interrupted by many episodes of scientific endeavour and high adventure so characteristic of the Romantic spirit: ballooning, exploring, soul-hunting. These were all part of the great journey.♣

♣ A brief guide to the many figures who jostle into this book, some familiar but others obscure or unexpected, appears in my Cast List, page 471.

It is also held together by, as a kind of chorus figure or guide, a scientific Virgil. It is no coincidence that he began his career a young and naïve scientific traveller, an adventurer and secret journal-keeper. However, he ended it as the longest-serving, most experienced and most domineering President of the Royal Society: the botanist, diplomat and *éminence grise* Sir Joseph Banks. As a young man Banks sailed with Captain Cook round the world, setting out in 1768 on that perilous three-year voyage into the unknown. This voyage may count as one of the earliest distinctive exploits of Romantic science, not least because it involved a long stay in a beautiful but ambiguous version of Paradise – Otaheite, or the South Pacific island of Tahiti.

1

Joseph Banks in Paradise

1

On 13 April 1769, young Joseph Banks, official botanist to HM Bark *Endeavour*, first clapped eyes on the island of Tahiti, 17 degrees South, 149 degrees West. He had been told that this was the location of Paradise: a wonderful idea, although he did not quite believe it.

Banks was twenty-six years old, tall and well-built, with an appealing bramble of dark curls. By temperament he was cheerful, confident and adventurous: a true child of the Enlightenment. Yet he had thoughtful eyes and, at moments, a certain brooding intensity: a premonition of a quite different sensibility, the dreaming inwardness of Romanticism. He did not like to give way to it. So he kept good company with his shipmates, and had carefully maintained his physical fitness throughout the first eight months of the voyage. He regarded himself – 'thank god' – as in as good mental and physical trim as a man could be. When occasionally depressed, he did vigorous jumping 'rope exercises' in his cabin, once nearly breaking his leg while skipping.[1]

He was capable of working patiently for hours on end in the extremely cramped conditions on board. The quarterdeck cabin, which he shared with his friend Dr Daniel Solander, was approximately eight feet by ten. He had adopted a strict daily routine of botanical drawing, electrical experiments, animal dissections, deck-walking, bird-shooting (when available) and journal-writing. He constantly fished specimens from the sea, shot or netted wild birds, and observed meteorological phenomena, such as the beautiful 'lunar rainbows'. When his gums had begun bleeding ominously with the onset of scurvy, he had calmly treated himself with a specially pre-prepared syrup ('Dr Hume's mixture') of concentrated lemon juice, taking precisely six ounces a day.[2] Within a week he was cured.

Just occasionally young Banks's scientific enthusiasm turned to explosive impatience. When rudely prevented from carrying out any botanical field trips by the Spanish Consul at Rio de Janeiro, and confined for three weeks to the sweltering ship in the harbour at Rio, he wrote colourfully to a friend at the Royal Society: 'You have heard of Tantalus in hell, you have heard of the French man laying swaddled in linen between two of his Mistresses both naked using every possible means to excite desire. But you have never heard of a tantalized wretch who has born his situation with less patience than I have done mine. I have cursed, swore, raved, stamped.'[3] Banks did however unofficially slip over the side at night to collect wild seeds and plants, a hoard which included the exotic purple bougainvillea.

Once among the Polynesian isles, Banks spent hours at the topgallant masthead, his large form crouched awkwardly in the crow's nest, looking for landfall beneath the heavy tropical cloudbase. At night the crew would hear distant surf roaring through the dark. Now at last he gazed out at the fabled blue lagoon, the black volcanic sand, and the intriguing palm trees (Linnaeus's Arecaceae). Above the beach the precipitous hills, dense with dark-green foliage and gleaming with white streams, rose sharply to 7,000 feet. On the naval chart Banks noted that the place was marked, prosaically enough, 'Port Royal Bay, King George the Third's Island'. 'As soon as the anchors were well down the boats were hoisted out and we all went ashore where we were met by some hundreds of the inhabitants whose faces at least gave evident signs that we were not unwelcome guests, tho they at first hardly dare approach us. After a little time they became very familiar. The first who aproachd us came creeping almost on his hands and knees and gave us a green bough the token of peace.'

Taking the hint, all the British shore party pulled down green boughs from the surrounding palm trees and carried them along the beach, waving them like ceremonial parasols. Eventually they were shown an idyllic spot close by a stream, where it was indicated that they could set up camp. The green boughs were thrown down in a great pile on the sand, 'and thus peace was concluded'. Here the British settlement known as Fort Venus was to be established: 'We then walkd into the woods followd by the whole train to whom we gave beads and small presents. In this manner we walked for 4 or 5 miles under groves of Cocoa nut and Bread fruit trees loaded with a profusion of fruit and giving the most

gratefull shade I have ever experienced. Under these were the habitations of the people most of them without walls. In short the scene we saw was the truest picture of an Arcadia of which we were going to be Kings that the imagination can form.'

As the men walked back, feeling dangerously like royalty, the Tahitian girls draped them with flowers, offered 'all kind of civilities' and gestured invitingly towards the coconut mats spread in the shade. Banks felt, reluctantly, that since islanders' houses were 'entirely without walls' it was not quite the moment to 'put their politeness to every test'. He would not have failed to have done so 'had circumstances been more favourable'.[4]

2

Tahiti lies roughly east–west just below the 17th parallel, one of the largest of what are now the Society Islands, roughly halfway between Peru and Australia. It is shaped not unlike a figure of eight, some 120 miles ('40 leagues') in circumference. Most of its foreshores are easily accessible, a series of broad, curving bays with black volcanic sands or pinkish-white coral beaches, fringed by coconut palms and breadfruit trees. But a few hundred yards inland, the ground rises sharply into an entirely different topography. The steep, densely wooded volcanic hills lead upwards to a remote and hostile landscape of deep gullies, sheer cliffs and perilous ledges.

Contrary to legend, the *Endeavour*, commanded by Lieutenant James Cook, was not the first European ship to make landfall in Tahiti. Spanish expeditions, under Quiroz or Torres, had probably touched there in the late sixteenth century, and claimed it for Spain.[5] A previous English expedition, under Captain Wallis of the *Dolphin*, had definitely landed there in 1767, when it was described as 'romantic', and claimed for England. A French expedition under Louis-Antoine de Bougainville had anchored there the following year, and claimed it for France.

The French had racily christened Tahiti 'La Nouvelle Cythère', the New Island of Love. Banks's opposite number, the French botanist Philibert Commerson (who named the bougainvillea after his captain), had published a sensational letter in the *Mercure de France* describing Tahiti as a sexual 'Utopia'. It proved that Jean-Jacques Rousseau was right about

the existence of the Noble Savage. But then, the French had only spent nine days on the island.♣

Cook was more sceptical, and had every member of his crew (including the officers) examined for venereal infections four weeks before arriving, by their surgeon Jonathan Monkhouse. He issued a series of Landing Instructions, which stated that the first rule of conduct ashore was civilised behaviour: 'To Endeavour by every fair means to cultivate a Friendship with the Natives and to treat them with all Imaginable Humanity.'[6] It was no coincidence that he enshrined the ship's own name in this instruction.

Joseph Banks had his own views on Paradise. He gave a whimsical account of his first night ashore in his *Endeavour Journal*. He dined deliciously on dressed fish and breadfruit, next to a Tahitian queen, who 'did me the honour with very little invitation to squat down on the mats close by me'. However, the queen was 'ugly enough in conscience'. Banks then noticed a very pretty girl, 'with a fire in her eyes' and white hibiscus in her hair, lingering in the 'common crowd' at the door. He encouraged her to come and sit on his other side, studiously ignored the queen for the rest of the evening, and 'loaded' the Polynesian beauty with bead necklaces and every compliment he could manage. 'How this would have ended is hard to say,' he observed later. In fact the amorous party broke up abruptly when it was discovered that his friend Solander had had a snuff-box picked from his pocket, and a fellow officer had lost 'a pair of opera glasses'. It is not explained why he had brought opera glasses ashore in the first place.

♣ De Bougainville's account of his ship anchoring at Tahiti for the first time in April 1768 became one of the most celebrated passages in all French romantic travel-writing. 'I have to admit that it was nigh impossible to keep 400 young Frenchmen at work, sailors who had not seen a woman for six months, in view of what followed. In spite of all our precautions, a young Tahitian girl slipped aboard and placed herself on the quarterdeck immediately above one of the big hatchways, which was fully open to allow air in to the sailors sweating at the capstan below. The young girl casually let slip the only piece of cloth which covered her, and appeared to the eyes of all the crew exactly as naked Venus appeared to the Phrygian shepherd. Truly, she had the celestial form of the goddess of Love. More and more sailors and soldiers crowded to the foot of the hatchway, and no capstan was ever wound with such alacrity as on this occasion. Only naval discipline succeeded in keeping these bewitched young fellows from rioting; and indeed we officers had some little difficulty in restraining ourselves.' Bougainville, *Voyage autour du Monde* (1771, Chapter 8, 'Mouillage à Tahiti').

This thieving proved to be completely customary in Tahiti, and led to many painful misunderstandings on both sides. The first occurred the following day, when a Tahitian quite openly made off with a marine's musket, and was immediately shot dead by a punctilious guard. Banks quickly grasped that some quite different notion of property must be involved, and noted grimly: 'We retird to the ship not well pleasd with the days expedition, guilty no doubt in some measure of the death of a man who the most severe laws of equity would not have condemnd to so severe a punishment. No canoes about the ship this morning, indeed we could not expect any as it is probable that the news of our behaviour yesterday was now known every where, a circumstance which will doubtless not increase the confidence of our friends the Indians.' Nonetheless, to Banks's relief and evident surprise, good relations were restored within twenty-four hours.

The *Endeavour* expedition remained for three months on Tahiti. Its main object was to observe a Transit of Venus across the face of the sun. (Cook stated that this was the reason their settlement was named Fort Venus, though his junior officers gave a different explanation.) This was due on the morning of 3 June 1769, and there would be no other transit for the next hundred years (not until 1874). It was a unique chance to establish the solar parallax, and hence the distance of the sun from the earth. This calculation depended on observing the exact timing at which the silhouette of Venus first entered, and then exited from, the sun's disc.

Banks was not part of the astronomical team, but when the expedition's quadrant was stolen one night shortly before the transit was due, he reacted with characteristic energy and courage. He knew that without this large and exquisitely calibrated brass instrument, used to measure precise astronomical angles, the entire observation would be rendered valueless. Not waiting for Cook or his marine guards, Banks roused the expedition's official astronomer, William Green, and set off immediately on foot in pursuit of the thief. In the dizzy heat, Banks followed the trail far up into the hills, accompanied only by a reluctant Green, one unarmed midshipman and a Tahitian interpreter. They penetrated seven miles inland through the Tahitian jungle, further than any European had been before: 'The weather was excessive hot, the Thermometer before we left the tents up at 91 made our journey very tiresome. Sometimes we walk'd sometimes we ran when we imagind (which we sometimes did) that the chase was just before us till we arrivd at the top of a hill about

4 miles from the tents. From this place [the interpreter] Tubourai shew'd us a point about 3 miles off and made us understand that we were not to expect the instrument till we got there. We now considerd our situation. No arms among us but a pair of pocket pistols which I always carried; going at least 7 miles from our fort where the Indians might not be quite so submissive as at home; going also to take from them a prize for which they had ventured their lives.'[7]

Banks decided to send back the midshipman with a brief message to Cook that armed reinforcements would be welcome. Meanwhile he and Green would press on alone, 'telling him at the same time that it was impossible we could return till dark night'.

Before dusk, Banks ran the thief to ground in an unknown and potentially hostile village. A crowd quickly gathered round them, 'rudely' jostling them. Following a Tahitian custom he had already learned, Banks quickly drew out a ring on the grass, and surrounded by 'some hundreds' of faces, sat quietly down in the centre. Here, instead of threatening or blustering, he began to explain and negotiate. For some time nothing transpired. Then, piece by piece, starting with its heavy wooden deal case, the quadrant was solemnly returned. 'Mr Green began to overlook the Instrument to see if any part or parts were wanting … The stand was not there but that we were informd had been left behind by the thief and we should have it on our return … Nothing else was wanting but what could easily be repaired, so we pack'd all up in grass as well as we could and proceeded homewards.'

By the time armed marines came up, sweating and jittery, about two miles down the track, Banks had completed the transaction and made several new friends. Everyone returned peacefully to Fort Venus on the shore. For this exploit, all conducted with the greatest calm and good humour, Banks earned the profound gratitude of Cook, who noted that 'Mr Banks is always very alert upon all occasions wherein the Natives are concerned.'[8] Banks concluded mildly in his journal: 'All were, you may imagine, not a little pleased at the event of our excursion.'[9]

Banks and Cook were a seemingly ill-matched pair. They were divided by background, education, class and manners. Yet they formed a curiously effective team. Cook's cool and formal manners towards the Tahitians were balanced by Banks's natural openness and enthusiasm, which easily won friends. With their help he would gather a mass of plant and animal specimens, and make what was in effect an early anthropological study

of Tahitian customs. His journal entries cover everything from clothes (or lack of them) and cookery to dancing, tattooing, sexual practices, fishing methods, wood-carving, and religious beliefs. His accounts of a dog being roasted, or a young woman having her buttocks tattooed, are frank and unforgettable. He attended Tahitian ceremonial events, slept in their huts, ate their food, recorded their customs and learned their language. He was pioneering a new kind of science. As he wrote in his journal: 'I found them to be a people so free from deceit that I trusted myself among them almost as freely as I could do in my own countrey, sleeping continually in their houses in the woods with not so much as a single companion.'[10]

3

Educated in the traditional classics at Harrow, Eton and Christ Church, Oxford, young Joseph Banks had discovered science and the natural world at the age of fourteen. Towards the end of his life he told a sort of 'conversion' story about this to his friend the surgeon Sir Everard Home. It was later enshrined by the French naturalist Georges Cuvier in his obituary speech or *Éloge* to the Institut de France. Emerging late one summer afternoon from a schoolboy swim in the Thames at Eton, the teenage Banks found himself alone on the river, all his schoolfriends gone. Walking back through the green lanes, solitary and preoccupied, he suddenly saw the mass of wildflowers along the hedgerows vividly illuminated in the slanting, golden evening light. Their beauty and strangeness came to him like a revelation. 'After some reflection, he said to himself, it is surely more natural that I should be taught to know all the productions of Nature, in preference to Greek and Latin; but the latter is my father's command and it is my duty to obey him … He began immediately to teach himself Botany.'

Despite the stilted form of this recollection (it is in Home's words and dates from fifty years after the event), it seems that to the young Banks botany implied a kind of Romantic rebellion against his father, as well as against the standard school curriculum of classics. Even more important, it brought him into contact with a race of people who would normally have been quite invisible to a privileged Eton schoolboy such as he. These were the wise women of the country lanes and hedgerows, the gypsy herbalists who collected 'simples' or medicinal plants 'to supply the Druggist and Apothecaries shops' of Windsor and Slough. They were a

strange but knowledgeable tribe, whom he soon learned to treat with respect. More than that, he paid them sixpence for every 'material piece of information' they supplied.

Banks also told Everard Home that it was his mother – not his father – who handed over her lovingly worn copy of Gerard's *Herbal*, kept 'in her dressing room', with wonderful engravings that entranced him. It is thus that he is shown in a family portrait (possibly by Zoffany): an attractively long-haired and long-legged teenager, alert and faintly insolent, confidently posed in a studded leather chair with a portfolio of botanical engravings spread before him. Just under his left elbow, extraordinarily prophetic, is a large geographer's globe in its mahogany cradle, with a rhumb-line of sunlight curving down towards the equator.

From then on Banks saw his destiny as a naturalist, and began avidly collecting rare plants, wildflowers, herbs, shells, stones, animals, insects, fish and fossils. His conversion story reveals other elements of his life and character: self-confidence, wealth, surprising sensitivity, unconventional directness, and an attraction to women. At university he made himself a disciple of the great Swedish naturalist Carl Linnaeus, the leading Enlightenment botanist of Europe. Linnaeus had redefined the taxonomy of plants by identifying them according to their reproductive organs, re-cataloguing them in Latin according to genus, species and family, and collecting an unmatched array of specimens in his gardens at Uppsala.

Finding that there was no Linnaean lecturer in botany at Oxford, Banks reacted in a characteristic way. He rode to Cambridge, begged an interview with the Professor of Botany there, John Martyn, and simply asked to be recommended the best young botanist available. He came back triumphantly with a gifted young Jewish botanist, Israel Lyons, who had agreed to teach the subject to Banks and a group of like-minded undergraduates at Oxford. Banks paid Lyons a good salary out of his own pocket. Later he recommended him to an Admiralty expedition, and he remained his friend and patron for life. Lyons was Banks's first scientific protégé. From the start Banks displayed the commanding air, as well as the charm, of a wealthy man. This trait was given free rein when his father died in 1761. At the age of eighteen he was now sole heir to large estates in Lincolnshire and Yorkshire (they included over 200 farms) which would bring him £6,000 per annum (eventually rising to over £30,000), an enormous income for the period.