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The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science
(Random House, 2008)
by Richard Holmes

GIVEN THE CLOUD OF VOLCANIC ASH stubbornly hanging over much of mainland Europe as I write this, it is instructive, and perhaps reassuring, to be reminded of a precedent. In April 1815, the Tambora volcano erupted in Indonesia. 'By releasing a mass of ash into the circulation of the upper atmosphere, it brought the "sunless summer" of 1816 throughout Europe, with a sinister red sky at midday, and blood-red apocalyptic sunsets' (383). The eruption contributed to a general sense of imminent natural catastrophe now so familiar to all of us. The seasons seemed to defy their appointed roles. Pink snow fell it Italy. Harvests failed, and Lord Byron wrote a poem, 'Darkness', that as Jonathan Bate has argued now seems uncannily prescient of global warming. In Richard Holmes's latest superlative work, Tambora is but one of countless vivid demonstrations of the capacity of the natural world to inspire both fear and veneration. Yet, as its title suggests, it is not only that the natural world should bear both beauty and terror within it. The beauty of nature, just like the science that reveals it, is inseparable from its terror.

Richard Holmes will be instantly familiar to readers of this journal as the author of the finest biography of Coleridge since Walter Jackson Bate. While Holmes's two- volume work did not quite match the exhilarating precocity of his debut, *Shelley: The Pursuit* (1974), it accomplished the monumentally difficult task of collecting Coleridge's impossibly various and long life into something like an order. Strong traces of this expansive, synoptic vision endure in what is in many ways Holmes's most ambitious work to date. *The Age of Wonder* could be classified as a specimen of the "group biography" genre now so in vogue. But it is no less a biography of science itself during the romantic period. The very notion of "romantic science" appears somewhat perverse, as Holmes himself freely admits: 'Romanticism as a cultural force is generally regarded as intensely hostile to science, its ideal of subjectivity eternally opposed to that of scientific objectivity' (xvi).

We are indeed accustomed to thinking of the period as a kind of scientific mid-life crisis: perched between the hallowed origin of Newton and the Royal Society on the one hand, and the definitively modern procedures inspired by Darwin on the other, British romantic science has come to be seen as a loose collection of quacks, amateurs and crackpots, of ballooning, devilish electromagnetism and laughing gas. It is Holmes's great achievement to demonstrate that such elements do more than make a dashing or amusing narrative. (In his hands, they naturally also do that.) A speculative, unorthodox temper, Holmes argues, did not merely happen to characterise scientific

enquiry of the late eighteenth and early nineteenth centuries: rather, a sense of 'wonder' was the essential ingredient in what scientific advancements were made.

Holmes's work has always centred upon eccentric polymaths, and the three figures that anchor *The Age of Wonder*—Joshua Banks, William Herschel and Humphry Davy—could each have inspired book-length treatments in their own right. Joseph Banks's 1769 voyage to Tahiti forms the first, memorable chapter, while his subsequent presidency of the Royal Society (1778-1820) provides a welcome focal point for the other disparate and singular figures that traverse the narrative. The exploration of Tahiti—or *Otahiti* as it was known to its native population—represents a kind of ideal of scientific exploration, in that it was undertaken largely for the sake of exploration itself. While the stated purpose of the excursion was to observe the Transit of Venus (the solar parallax would enable the explorers to calculate the distance of the sun from the earth), it quickly becomes apparent that the explorers use the unfamiliar island as a basis for their own personal explorations—and not always of a strictly scientific nature.

Joseph Banks was the very definition of the explorer led more by the imperative of exploration itself than any definite sense of what he was looking for. With Linnaeus as his hero, his own interests lay more in botany than astrology; but most of all, he was a man of voracious curiosity—along with other appetites. Physically robust, Banks was seemingly impervious to the various diseases that affected his comrades, and just as eager to classify native social customs, as he was the local flora and fauna. The indigenous population represented a source of fascination from the start, and Banks proved one of the few eighteenth-century voyagers capable of taking a proto-anthropological interest in such communities, without reducing them to romantic notions of the noble savage. Banks certainly was no distant or impartial scientific observer in this respect: he established relationships of varying emotional attachment with several Tahitian women, including the queen Oborea, a regular mistress Othothea, and a woman named Terapo who for unexplained but probably amorous reasons once struck her forehead with a shark's tooth in Banks's presence, causing her to lose a pint of blood (22). Banks is alone among the explorers to attempt to learn the native Tahitian language, and we see translation becoming increasingly a two-way process. Holmes wryly notes that in addition to the nouns essential to bartering, in Banks's dictionary,

> [t]here are also some verbs, including those for stealing, understanding, eating, and being angry or tired. But the list cannot be very complete, since there are no words for love, laughter or beauty – and it would be difficult to talk Tahitian without any of these. (19)

The later stages of the voyage are a familiar colonial tale of venereal disease, simmering tension between the natives and explorers (it is not for nothing that 'stealing' is first on Holmes's list of verbs), and inevitable reprisals. Yet we

have the sense that Banks, who was so quick 'to abandon European inhibitions, including his clothes' (26), remained essentially at home in the continued estrangement of Tahitian society. His return to Britain leads him to break off his engagement, and even in his later years—corpulent, knighted and representing the very scientific institutionalism he once flew in the face of—he continues to pine for his erstwhile terrestrial paradise. In coming years, the exploration of territories such as Tahiti, the scientific rationale for which was fairly diffuse in any case, would become increasingly subordinated to national, colonialist imperatives. True scientific explorers would have to look beyond the earth itself for their sense of wonder.

It is at this point that the astronomer William Herschel intrudes as the second figure in Holmes's narrative. Untrammelled curiosity is about all that unites two such distinct temperaments: where Banks was garrulous, libertine and perfectly at home on the sun-kissed island of Tahiti, Herschel proved (at least in his early years) socially reticent, a confirmed bachelor who lived by night, during which he conducted his famously minute lunar observations. We first encounter him 'in Bath, standing alone in a cobbled backstreet, viewing the moon through a large telescope' (60). Nonetheless, it would be reductive to categorise Herschel as the solitary genius—that romantic-scientific myth that is still very much with us—for a number of reasons. For a start, he had taken the then very unusual step of migrating to England from the Hanover of his birth, having taken to the country while stationed on military duty. Herschel supported what was then an astronomical hobby by working as a musical tutor, and a mystical sense of the harmony of the spheres continues to underpin his scientific work—but also an urbanity, and preparedness to think outside the purview of science. Unlike Banks, moreover, Herschel was able to strike up a genuine working relationship with another human being and co-explorer, in this case his sister Caroline, who followed her beloved brother to England, and became his dedicated and often long-suffering companion in his marathon observatory sessions. (So acute and patient was Caroline's own astronomic work that she fully deserves the title of scientist in her own right; not the least of Holmes's achievements is to make her innovations clear.)

The solitary path that led William Herschel down that alleyway in Bath was, furthermore, a matter of necessity rather than eccentric whim: in the Britain of the late eighteenth century, no comparably powerful telescope was commercially or institutionally available, and so the largely untaught Herschel was forced to construct his own *speculum*, a highly-polished mirror that not only magnified but also concentrated light according to Newtonian principles. Nothing similar existed in the traditional refractor mirrors of the time. This forced independence makes Herschel's many scientific breakthroughs only more impressive. The most famous of these came on April 6 1781, where Herschel observed a spectacularly large comet, which strangely seemed to have 'no appearance of any beard or tail' (97). This tailless aspect meant, as Herschel well knew, no less than a new planet: the first recorded sighting of

what today we term Uranus, (although Herschel initially attempted to christen it 'Georgium Sidus', after the Hanoverian king, an alternative that would at least have spared us generations of juvenile schoolboy jokes).

Humphry Davy, the last of Holmes's triumvirate, is perhaps the best known to readers of this journal, on account of his longstanding friendship with Coleridge. Once again, Holmes is on ideal ground with a figure whose energy and delight in contradiction could well describe his own prose style:

> Davy was small, volatile, bright-eyed, and bursting with energy and talk. He had measured the cubic capacity of his own lungs, which was vast, especially since he was only five foot five tall, with a chest, which he had also measured, of a mere twenty-nine inches. He spoke English with a Cornish accent, and French with a Breton accent. (235)

Of the three figures, Davy is most able to preserve this youthful variety throughout his scientific career. From his now-notorious experiments with laughing gas (though even laughing-gas had its unfunny side, producing both depression and addiction in this unorthodox researcher), he went on to isolate elements such as sodium, potassium and calcium, and later design a wire gauze lamp that significantly reduced mining accidents (the "Davy lamp" continues to bear his name). Much like Banks and Herschel, official recognition did not, however, prevent a certain encroaching conservatism (an interesting contrast here would be with those romantic poets, such as Wordsworth and Coleridge, who also lived to see old age). He was capable, for instance, of remarkable ungenerosity toward his then-assistant Michael Faraday, which *The Age of Wonder* glosses a little.

On a more positive note, Davy enables Holmes to return to the terrain of romantic poetry with which he has long been familiar. The interaction of verse with science always was, Holmes reminds us, a two-way process: not only did figures such as Davy (much like Erasmus Darwin, in his *Zoönomia*) versify their scientific observations; conversely, the tradition for poets to provide pseudo-scientific explanatory "notes" also persisted all the way through to Shelley's *Queen Mab*. Davy's youthful verse is charming yet rarely moves beyond the heuristic, as an insight into the unfolding of a brilliant mind. One work that might well possess significance for scholars both of literature and philosophy of science, by contrast, is Davy's much later *Consolations in Travel or the Last Days of a Philosopher* (1830), a haphazard compendium of his life's many interests, which—Holmes's scattered but revealing references suggest—fully deserves a modern rereading.

Some sense has hopefully been gleamed of the force with which Holmes reanimates these three scientific specimens. Yet *The Age of Wonder* further contextualises their stories in a wealth of historical and thematic detail. Holmes's characteristically expansive footnotes (each marked with a three-leaf clover, although they prove anything but commonplace) sketch everything from the scientific resonances of contemporary romantic poetry, to the latest

academic literature on comets. As always, Holmes wears his learning lightly. One of the most consistently rewarding themes to emerge is gender, where Caroline Herschel is only the most prominent woman to contribute to (and suffer at the hands of) science. In the almost unbearably vivid opening to a chapter on Mary Shelley's *Frankenstein*, Holmes relates the novelist Fanny Burney's mastectomy, which she underwent without anaesthetic. To a modern sensibility it is almost incomprehensible that Burney was not only able to actively observe much of the operation as it proceeded, but felt the necessity of committing the experience of 'the Knife *rackling* against the breast bone' (306) to writing. It is perhaps ungenerous to wish that a book that already does so much to recover the submerged female contribution to science should devote yet more time to such individual lived experience, of the scientific transformations that changed lives, or that failed to arrive quite soon enough.

Other minor reservations to *The Age of Wonder* can only be understood in a similar way, as a response to the work's sheer suggestiveness. A reader with one eye on the title might complain that there is far more 'beauty' in Holmes's account of romantic science than there is 'terror'. In this respect, the entirely understandable desire to counter the lazy supposition that romantic culture should be hostile to the aims and method of science perhaps leads Holmes to overcompensate. In the chapter on Mary Shelley's *Frankenstein*, which aside from Fanny Burney's experience has rather a summary feel not true to the work as a whole, we are reminded of the various gloomy fears that science inspired. But 'terror' does not need only to be terror *of* science (or a reductive notion of what science is taken to be). Indeed, there are some terrors that we need science (and perhaps only science) to reveal. So for instance Pascal's philosophical fear of infinity could only have been understood through Newtonian mechanics and contemporary astronomy. Percy Bysshe Shelley revealed such intimations were alive and well in the romantic age, when he wrote in *Queen Mab* that '[a]ll that miserable tale of Devil, and Eve, and an Intercessor, with the childish mummeries of the God of the Jews, is irreconcilable with the knowledge of the stars.' Yet Shelley's own career would show just how little such a strident positivism could suffice in itself.

This unwillingness to consider how romantic culture could in complex ways both have needed yet felt repelled from scientific method might explain why the notion of what remains definitively "romantic" about these figures remains somewhat underdeveloped. Beyond a general sense of wonder, what distinguishes Banks, Herschel and Davy from their immediate precursors and inheritors? In this respect, *The Age of Wonder* remains a biography of romantic science, but not quite a critical genealogy. There are frequent hints regarding the ideologically distinct, increasingly professionalised direction that modern science—through the obvious example of Darwin but also the growing prominence of private organisations such as the Royal Institution—without Holmes ever specifying precisely what this watershed might comprise. Is the "romantic" in "romantic science" something to do with openness of method?

A principle of experimentation? A necessary capacity to think beyond science's own structures?

These are far from idle questions, for they continue to preoccupy our current age. It is in this sense, indeed, that *The Age of Wonder* feels a timelier book even than Holmes's past work. For today we are witnessing society's renewed attempt to comprehend its position toward science, following a century where its 'terror' was frequently uppermost in people's minds. The countless instances of such an attempt range from the popular to the academic spheres. Recent anniversaries both of Charles Darwin's birth and the foundation of the Royal Society have placed science firmly at the heart of contemporary public debate. On a more obviously ideological level, we find ourselves privy to the frankly depressing conversation between the scientistic "new atheism" of Richard Dawkins and Daniel Dennett on the one hand, and a resurgence of religiosity in thinkers such as Terry Eagleton or John Milbank on the other. *The Age of Wonder* proves in many ways an attempt to situate itself beyond the dismal opposition, where the irrational element in human endeavour is either banished from scientific method entirely, or else uncritically celebrated as an inherently anti-scientific force.

The more rarefied but no less polemical academic realm, meanwhile, has found itself no less needing to rethink its position (and often its kneejerk aversion) toward science. The humanities in general are still in the process of coming to terms with Martin Heidegger's peremptory claim that science 'does not think'. The current work of heterodox philosophers of science such as Bruno Latour and Simon Schaffer represents the beginnings of an attempt to come to term with such a legacy. A wave of recent scholarship, including Neil Vickers's excellent *Coleridge and the Doctors* (2004), and Noel Jackson's *Science and Sensation in Romantic Poetry* (2008) has attempted to consider what affinities romantic literature shared with sciences hard and soft. It is evidently not the task of any work of popular biography to resolve such issues. It is testament to Holmes's mastery of the genre, that *The Age of Wonder* is able to pose them at all.