

▶ attention of the national Counter-intelligence Corps, which suspected a leak from the Manhattan Project; swathes of the personnel at the project's site in Los Alamos, New Mexico, were science-fiction fans. Campbell was aggressively interviewed by an intelligence agent, Cartmill's personal correspondence was put under surveillance, and *Astounding* came close to having its mailing privileges revoked. After the war, Campbell often cited the incident to demonstrate the genre's prophetic nature — its capacity to project a convincing fictional future from known scientific facts.

Indeed, the unprecedented technological advances of the war fuelled the public taste for science and technology, in turn raising the cultural status of science fiction. The late 1940s and 1950s were a boom time for the genre. That boosted the stock of *Astounding*, which came to specialize in stories of nuclear conflict and crisis. It also led to the rise of competing titles such as *Galaxy* and *The Magazine of Fantasy & Science Fiction*, as well as an expansion of the science-fiction book market. Campbell's talent began to be poached.

Nevala-Lee carefully traces the rifts that developed in the core group, largely prompted by Campbell's increasing fondness for pseudo-scientific ideas such as the Dean drive (proposed by inventor Norman Dean, who claimed it could produce thrust without a reaction — in violation of the laws of motion).

More generally, Campbell had always been obsessed by the possibility of a truly scientific psychology, which he believed would have predictive power along the lines of the fictional science of psychohistory in Asimov's Foundation series. So when Hubbard, in the late 1940s, shared ideas that later became his 'self-help system' Dianetics, Campbell took the bait. Hubbard's vision of

superpowers purportedly lurking in everyone — once they had gone through an 'auditing' process and emerged as 'clears' — gripped Campbell, and he helped Hubbard to market his 1950 book *Dianetics*. Nevala-

Lee's gift for the hard sell was pivotal, and Nevala-Lee's portrait of him as a paranoid narcissist and skilled manipulator is scathing. However, Campbell is also sharply scrutinized for his role in midwifing and unleashing *Dianetics*. Heinlein and Asimov were repelled by what they saw as an uncritical embrace of quackery, and took refuge in newer, often more lucrative markets. The book's final chapters detail the steady decline of the magazine into a second-rank publication, and Campbell (who died in 1971) into a reactionary crackpot with racist views.

Although much of the story outlined in *Astounding* has been told before, in genre histories and biographies of and memoirs by the principals, Nevala-Lee does an excellent job of drawing the strands together, and braiding them with extensive archival research, such as the correspondence of Campbell and Heinlein. The result is multifaceted and superbly detailed. The author can be derailed by trivia — witness a grisly account of Heinlein's haemorrhoids — and by his fascination for clandestine love affairs and fractured marriages. He also gives rather short shrift to van Vogt, one of Campbell's most prominent discoveries and a fan favourite during *Astounding's* acme, whose work has never since received the attention it deserves.

These quibbles aside, the book is a rich, gripping cultural and historical study of how a small cadre of talents

in a minor commercial genre became some of the most influential figures of the second half of the twentieth century. ■

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*Astounding Science Fiction's* cover for May 1947.

Lee argues that a lingering messianism at the heart of science fiction — its "persistent dream of an exclusive society of geniuses" — helped to propel Hubbard's movement, which became Scientology. Numerous sci-fi authors embraced Dianetics, submitting to auditing or even becoming trained auditors; A. E. van Vogt briefly abandoned his writing career to run a chapter in Los Angeles, California.

recover the story of how Lister's daughters learnt to draw and etch scientifically accurate natural-history illustrations. Records of women's scientific work from this time are scant; naturalist and illustrator Maria Sibylla Merian's spectacular drawings of Surinam's insects are among the rare surviving examples.

## NATURAL HISTORY

# Scientific artistry of the Lister sisters

**Beth Fowkes Tobin** applauds a book on a gifted family of early-modern naturalists.

Between 1685 and 1692, Martin Lister — a noted British physician and naturalist — published *Historiae Conchyliorum*, a significant study of molluscs filled with hundreds of beautiful illustrations of all known shells. The illustrators were Lister's daughters Anna and

Susanna. How these drawings and etchings came into being in an era that excluded women from formal scholarship is meticulously shown in *Martin Lister and his Remarkable Daughters*.

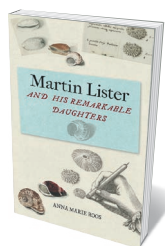
Historian Anna Marie Roos marshals her considerable talents as a researcher to

As Roos relates, Susanna and Anna Lister were in their teens when their father enlisted their services as illustrators for his ambitious project. They spent nearly a decade working on it, an amazing feat noted by Lister's friend Edward Lhwyd, naturalist and keeper of the Ashmolean Museum in Oxford, UK. In teaching his daughters how to draw, Lister also taught them how to see animal and plant specimens as a scientist would. He may have sat with his daughters while they drew the shells, to point out characteristics key to classification. (As he noted in another context, such supervision was important to ensure that "the excellent artist did not merely ... express his own personal conception".)

Lister also instructed Susanna and Anna in etching and engraving, skills rarely taught to women at the time, because they were viewed as arduous and dangerous. Engraving demanded physical strength to cut the surface of the copperplate; etching, the use of hazardous nitric acid to dissolve away the metal.

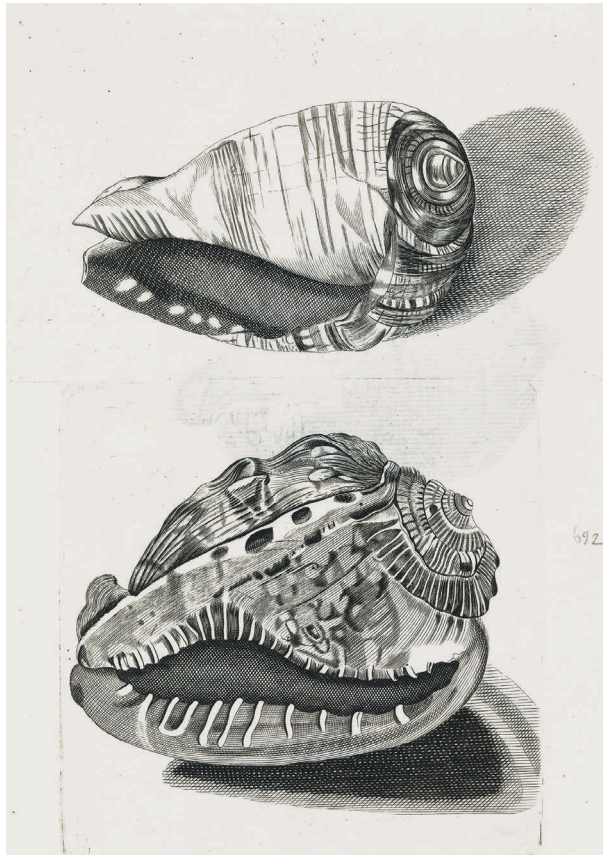
The Lister sisters may have been the first women to use microscopes in producing images — for *Historiae Conchyliorum* and to accompany letters published in the Royal Society's journal, *Philosophical Transactions*. Two of these, on wood grain and salt crystals, were authored by the pioneering Dutch scientist and microscopist Antonie van Leeuwenhoek. Anna may also have learnt to dissect specimens. Annotations in her notebook indicate as much, and among her original drawings for the Listers' opus is a "depiction of a brachiopod gill and dissected mollusc penises". Anna also drew illustrations of the bodies of living snails for the final volume — an innovation that would not be repeated until the mid-eighteenth century, when French conchologists turned their attention to the mollusc itself, instead of its shell.

Roos portrays these extraordinarily talented young women as beneficiaries of their polymath father, whose indefatigable curiosity about the natural world drove his achievements, and who gave his daughters unusual latitude in pursuing the art and science of conchology. Nearly half the book is a biography of Lister



**Martin Lister and his Remarkable Daughters: The Art of Science in the Seventeenth Century**  
ANNA MARIE ROOS  
Bodleian Library  
(2018)

as a physician to London's elite, popular travel writer and vice-president of the Royal Society. He was the first serious arachnologist and conchologist in Britain, and an expert on viticulture. He also dabbled in



Two engravings of shells from *Historiae Conchyliorum*.

chemistry, pharmacology and mathematics, and contributed to theories about the age of Earth through his study of fossilized shells.

Roos places Lister at the centre of the movement towards observational empiricism in studying the natural world, as the nascent discipline shifted in focus from exotica to a more systematic gathering of data, locally and globally. Active in many scientific networks, he had contacts ranging from local York engravers, chemists and printers to luminaries such as naturalist James Petiver, physician and collector Hans Sloane and naturalist John Ray, all of whom delivered specimens, drawings, books and advice (see H. Nicholls *Nature* 545, 410–411; 2017). Sloane, for instance, lent the Listers Jamaican shells for their work.

Roos also explores the Listers' later legacy, in particular the republication of *Historiae Conchyliorum* in 1770, allowing broader access to an authoritative work. Emanuel Mendes da Costa, author of *Elements of Conchology* (1776) and *British Conchology* (1778), complained to a friend that the Listers' volumes were "very scarce" and not to be found in booksellers' shops; he was

particularly eager to purchase a reissue.

Roos describes the archival afterlife of Anna and Susanna's works and equipment, complete with tales of treasures lost and found. The copperplates, thought to be lost, were rumoured to be housed in tea chests at Oxford, until Roos tracked them down in the Bodleian Library.

The colour plates in Roos's book are gorgeous, especially those from the notebooks and sketchbooks, their beauty heightened by their ephemerality. Martin Lister's drawing of a strawberry finch reveals a skilled illustrator who "performed a type of embodied empiricism". Even more stunning, some of the reproduced illustrations are juxtaposed with photographs of the very shells they depict. Roos thus showcases a material legacy central to the history of how early-modern scientific books were produced.

*Martin Lister and his Remarkable Daughters* is lucid and on occasion surprisingly funny. Most of the time, Roos keeps her narrative threads meshed, interweaving the separate achievements of father and daughters with the trajectory of their opus. But I wished for less biographical detail on Martin Lister's youth and education. (This material is readily available in Roos's 2011 monograph *Web of Nature*.) Those eager to learn about Anna and Susanna and their scientific and artistic legacy will be delighted by the final two chapters and the

photographs of their artwork.

As for their personal lives, details are scarce; but Roos has scrounged a few tantalizing tidbits. After their epic stint on the book ended, Susanna married one Gilbert Knowler, becoming his third wife. Less is known about Anna, but Roos has uncovered the possibility that she married John Bristow in 1701 against her father's wishes, which would explain why she was not mentioned in his will. Yet, however rich the biographical detail on Martin Lister, the sisters' exquisite scientific contribution tells a story of its own.

Roos is to be congratulated on recovering an important episode in the intertwined history of art and science in the early-modern period, the history of scientific-book production and the hidden role of women in the history of science. ■

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