

BOOKS & ARTS

A vision of the nanoscale

A collaborative effort between a photographer and a chemist could show scientists how to make the small scale more intuitive, says **Jeremy Baumberg**.

No Small Matter: Science on the Nanoscale

by Felice C. Frankel and
George M. Whitesides

Belknap Press (Harvard University Press):
2009. 192 pp. \$35, £25.95, €31.50

On the bookshelves of my childhood, I remember science encyclopaedias that were filled with images of natural and synthesized wonders. No modern shelf should be without titles that chart today's exploration of science's outer limits. But whereas hoards of glossy books have been published on astronomy, for example, the small world has been shy to emerge. Perhaps this is partly because nanoscience, like postmodern art, seems to demand a lengthy explanation of what we are viewing — but at the expense of an unmediated experience.

Reorienting our eye to the nanoscale is *No Small Matter*. This coffee-table book juxtaposes images and ideas to encapsulate the significance of size and shape. It is the product of a second collaboration between science photographer Felice Frankel and chemist George Whitesides, and follows their project to capture images of pattern formation on surfaces (*On the Surface of Things*; Harvard University Press, 1997). Exploring where art meets science, the authors search for promising paths to make small-scale science more intuitive.

Science-art collaborations frequently end up as one-way processes, with science donating the metaphors to a consumerist arts culture that fashions them into a new end product. Frankel avoids this trap by using images — photographs on a human scale and through microscopy — to frame graphic icons that encapsulate a theme and draw in the viewer. As with much of art, the explanatory power of these pared-down representations relies on the previous experiences of the person who enquires of it, so the collection is a hit-and-miss affair. For instance, my response to their photo of an abacus that introduces the theme of counting in binary — clicking, serried ranks — might be very different from yours.

Partnered with each photograph is a short, blog-like column. The text informs while the image reinforces the text's metaphors, each pair offering a self-contained journey. The book's themes — conveyed in textbook-like



This glass apple's curious shadow (part round, part cube) symbolizes the duality of the quantum world.

sequence by bold numbering — include structural and conceptual underpinnings at the small scale; life and engineering; and nanotechnology's potential risks and prospects. It is a highly personal tour of science that benefits from the clear intuition born from Whitesides' experience. Such thoughtful tactics epitomize the difficulty of making the revelations of nanoscience accessible.

The weaving of an eminent nanoscientist and an inspired photographer creates a sometimes inconsistent cloth. Some images inspire awe, such as the delicate cage of the marine sponge known as Venus's flower basket, or the grasping arrays of polymer rods described as nano-fingers. Others lack depth, such as the ubiquitous candle flame. And yet others don't quite illuminate, such as a depiction of the quantum world through an artificially rendered cubical shadow of a spherical apple. Forcing such visual simplicity leads to metaphors that hang flapping — for example, a full or empty wine glass caricatures the digital nature of a binary bit, but it doesn't help to explain the elegant binary logic of $1 + 1 = 0$. Nonetheless, the authors' engagement is stimulating.

The book does convey the idea that shape and size matter hugely to nanoscale function. It captures well the mystery of how the layering of these simple concepts generates the

complexity of life. But the authors' attempts to justify the funding and ambition of nanoscience are awkwardly conflated with societal challenges, such as clean-energy generation. Although there are connections, they don't emerge simply from the preceding material, leaving the reader bewildered.

The big-science communities of particle physics, genomics and astronomy are highly organized when disseminating knowledge and lobbying on behalf of their fields. Despite its much greater number of practitioners, the nanoscience crowd has not spread its messages across wider society. Using images such as these to build people's familiarity with nanoscience can provide a visual shortcut that connects emerging stories with a broader message.

Frankel and Whitesides' book adds gravitas and nuance to the popularization of nanotechnology, articulating its interest and vast opportunities. Rather than being stuck on a teenager's bookshelf, *No Small Matter* should lie open on our coffee table, inviting comment.

Jeremy Baumberg is professor of nanophotonics and director of the Nano Doctoral Training Centre at the Cavendish Laboratory, University of Cambridge, Cambridge CB3 0HE, UK. e-mail: j.j.baumberg@phy.cam.ac.uk