At the same time, *The Nature of Tomorrow* feels like a promise unfulfilled. When I started reading it, I hoped for a deeper analysis of the causative weight of the history of environmental dreaming. Despite signaling the political and material force of stories about the future early on, Rawson rarely actually addresses the political impacts and implications of the stories that he chronicles. Unfortunately, his encyclopedic depiction of environmental futures over time comes at the expense of an in-depth investigation of the political performativity of these stories. This is doubly disappointing, given that recent histories about the performativity of the future have proven incredibly valuable for our understanding of our current ecological predicament. To name but one masterful example: Jenny Andersson's *The Future of the World* (Oxford, 2018) clearly shows how research into the future is always an attempt to influence decision making in the present—and hence always political.

Coming to the end of *The Nature of Tomorrow*, one cannot help but miss this political weight. How and why did these stories become influential? What effects did they have politically? How did they reproduce and influence the West's imagination of its own present and past? And, perhaps most important, how might Rawson's overview help us to navigate the challenges of the twenty-first century, in which the environmental future appears diminished and threatened wherever one turns? Still, despite my dissatisfactions, I wholeheartedly recommend that those interested in (the history of) the environmental future read the book, teach the book, and discuss its shortcomings. I, for one, will be treating it as a valuable resource.

Jeroen Oomen

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Jack Challoner. *Seeing Science: The Art of Making the Invisible Visible*. 272 pp., illus., index. Cambridge, Mass./London: MIT Press, 2022. $34.95 (paper); ISBN 97802625443.

Seeing Science: The Art of Making the Invisible Visible is a paradoxical book. Its author, Jack Challoner, is trained in physics and worked at the Education Unit of the Science Museum in London before becoming a prolific independent writer. He has published well-received "visual tours" on the cell, the atom, water, and the elements, as the building blocks of life, matter, and the universe. Expectations are high, then, for this book in which Challoner, as a true curator, takes the reader by the hand on a visual tour through science to show how scientific imagery makes visible knowledge that is invisible to the human eye. He does so in four sections, one focusing on material instruments, the second on the importance of (big) data, a third on mathematical and computer simulations, and a last one that explores how artists create impressions of the unseen and the invisible on the basis of evolving scientific insights. All of the images are indeed, as Challoner repeatedly says, "stunning" in their beauty and "celebrate" the accomplishments of science. Even though there are some images (e.g., the famous diagram by Florence Nightingale) that stem from the social or sociobiological sciences, most are from the natural sciences, with an emphasis on (astro)physics and contemporary images.

The paradoxical character of Challoner's collection of images does not reside in its title, but in the jarring contrast between his introduction and the substance of the book. In the introduction Challoner quotes Leonardo da Vinci, who wrote that a poet cannot so well describe with words "what a painter is able to show you in an instant," a citation that nowadays is better known in the version by Arthur Brisbane, editor of the *New York Evening Journal*, from 1911: "Use a picture. It's worth a thousand words." Challoner uses these citations to argue, backed by neuro-research, that the visual sense is by far our most efficient sense in conveying knowledge. However, for many of the images he presents, it is quite difficult to see what knowledge is conveyed by making things visible. An artist's impressions of gravitational waves or of the spiral structure of the Milky Way galaxy are perhaps constructed on the basis of scientific data, instruments, and theories, but we do not "see"

gravitational waves in the direct sense with respect to which Challoner defends the efficiency of our visual sense in the introduction. Indeed, many of the images in this volume are not seen at all but exist only as the (imagined) result of the instruments and assumptions used to construct them. The claim that a picture is worth a thousand words thus runs on a collision course with the fact, acknowledged by Challoner in passing, that none of the book's spectacular images convey any knowledge without the accompanying words that explain what we are looking at. The hidden message of Challoner's book is therefore quite in contrast with the celebration of our visual sense set out in the introduction. Our visual sense may be dominant, but we cannot simply trust what we see. The infographics of one of the early innovators of the visual representation of statistical data, William Playfair (1759–1823; not present in this volume), were not incidentally considered to deceive rather than inform as to the state of the British economy. Challoner nowhere addresses the ambiguities of the images and their construction and what they convey. He shows no trace of hesitation in taking the authority of science as given and its rendering in visual form as unproblematically showing "knowledge." And that is unfortunate. For decades visualization has been a well-discussed topic in the history and philosophy of science and technology, but the fruits of this literature do not seem to have reached Challoner. I found this surprising for someone with a background at the Education Unit of the London Science Museum and a missed opportunity for a book that, as the author rightly emphasizes, presents such stunning images.

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Harro Maas

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Martin Brückner; Sandy Isenstadt; Sarah Wasserman (Editors). *Modelwork: The Material Culture of Making and Knowing*. 312 pp., illus., index. Minneapolis/London: University of Minnesota Press, 2021. $30 (paper); ISBN 9781517910907. Cloth available.

Because models are so pervasive, "crossing professions and academic disciplines and permeating everyday life" (p. vii), we should write about them. But how? While attempts are made in *Modelwork: The Material Culture of Making and Knowing* to define models, particularly in Chapter 1, all other chapters address the more pertinent question: What do they *do*? This simple question is not easy to answer because models do many different things in different fields, as testified by the book's coverage of a wide variety of fields: natural philosophy (Ch. 3), drawing instruction books (Ch. 4), music software (Ch. 5), patents (Ch. 6), body measurements (Ch. 7), virtual reality (Ch. 8), midwifery (Ch. 9), shoemaking (Ch. 10), and digital humanities (Ch. 11). Despite this wide range of doings, the materiality of the model matters to all of them. The model's materiality, "its physical presence, its sensible materials, the volume it occupies" (p. ix), affects how we can work with it. According to the editors, a model is "a mediating process, a mechanism for doing something" (p. x), a process they call "modelwork."

   This approach, with its particular focus on materiality and seeing models as mediators, is clearly based on Mary S. Morgan and Margaret Morrison's *Models as Mediators* (Cambridge, 1999), which first addressed both aspects. However, the scope of the fields those authors covered was limited to physics and economics. *Modelwork* nicely shows that models are not only the critical instruments of modern science but have also become the essential tools with which we shape the world around us. While *Models as Mediators* is recognized as one of the relevant sources for *Modelwork*, I would like to make one critical remark about the latter volume. In the introductory chapter, along with the incorrect publication date, the reference to *Models as Mediators* gives the wrong name for the second editor: instead of Morrison, Steve Woolgar is credited. In Chapter 1, Morrison is referred to as a "distinguished economist" (p. 6); she was actually a distinguished philosopher of science. And in the same chapter her name is replaced again in a reference to *Models as Mediators*, this time by that of Charles Baden-Fuller. This careless referencing harms the otherwise excellent quality of *Modelwork*.