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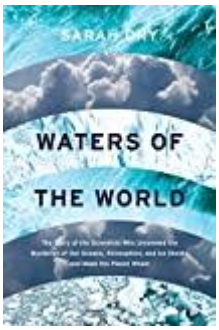

Sarah Dry. *Waters of the World: The Story of the Scientists Who Unraveled the Mysteries of Our Oceans, Atmosphere, and Ice Sheets and Made the Planet Whole.* Chicago: University of Chicago Press, 2019. 321 pp. $30.00, cloth, ISBN 978-0-226-50770-5.

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Water is startling in its flexibility and power. It takes so many forms—oceans, rivers, clouds, rain, ice, gas—and can shape our landscape through torrents or single drips. If I push the metaphor a bit, the same might be said of knowledge: it comes in many forms, sometimes unrecognizable from one another, and can change the landscapes of our understanding in huge gushes or with a single droplet of an idea. In *Waters of the World*, which takes both water and ways of knowing as its subject, Sarah Dry shows how, in their studies of different forms of water, scientists have created knowledge that has, over time, interacted in sometimes surprising ways to result in a global understanding of climate systems. By zeroing in on the experiences of key figures in different fields, Dry works to bring more than 150 years of research on multiple continents within the grasp of readers.

Combining scholarship in the history of science with the published and personal papers of the scientists themselves, *Waters of the World* joins a growing number of histories seeking to explain how our understanding of global climate and climate science emerged (for example, see Deborah Coen's *Climate in Motion* [2018] and Paul Edwards's *A Vast Machine* [2010]). Yet Dry is interested not only in scientists' conclusions, but also in the passions and emotions that animated and informed their work. By focusing on the humanity of researchers, Dry illuminates how "the contingency of individual lives has influenced the creation of what might otherwise seem to be a natural object—the system of the earth, the vision of the globe" (p. 272). The scientists here are presented with their charms, flaws, and, most of all, the playfulness, awe, and desire they brought to their work. In arguing for the importance of interdisciplinarity and different ways of knowing, Dry invites us all—scientists, historians, readers from all walks of life—to approach the planet's climate crisis with our own sense of curiosity and willingness to imagine alternatives.

Each chapter of Dry's elegant prose introduces readers to one of six key figures, from different periods and scientific fields, ranging from John

Tyndall's work in the 1850s to understand the causes of glacial movement and the impact of water vapor on the atmosphere to Joanne Simpson's wide-ranging investigations in the mid-twentieth-century United States into the dynamics of clouds, their impacts, and whether they could be manipulated. Although few, if any, of the scientists profiled understood themselves to be part of the same scientific project, by placing them alongside one another Dry deftly shows how these disparate pursuits created ways of knowing the world that, in turn, demonstrated the interconnectedness of the world's natural systems that we now take for granted. These chapters are largely presented as biography; Dry allows us to get to know the scientists as fully formed people, capturing their eccentricities, their charm, their foibles, and how their personal values interacted with their work.

This emphasis on individual scientists not only makes the book engaging to a nonspecialist audience, but it also underscores one of Dry's key ambitions. By emphasizing the embodied work of scientists, from the physical discomforts they face in the field to the personal grudges that sometimes animate their work, *Waters of the World* encourages readers to understand scientists as people. These details, along with Dry's careful attention to explaining how each researcher would have understood his or her research, help us to set aside whatever modern scientific knowledge we bring to the book and see through the eyes of these five men and one woman.

At the heart of Dry's profile of each scientist is an emphasis on their sense of play, wonder, and curiosity. Charles Piazzi Smyth, while observing the atmosphere through a spectroscope on a mountainside in 1856, also took photographs of the landscape and plants surrounding him, seeming to delight in the very act of documentation. Henry Stommel, at the end of a lifetime of exploring the mysteries of ocean currents, still found that science failed to capture the awe-inspiring scope of nature. The stories demonstrate the importance of play in knowledge-making and the idea that discoveries often arise in places we do not expect to find them. Yet the wonder at the heart of this book is much more than a tool for discovery; it is a way of engaging the world that Dry urges us all to embrace: "Their playful exploring was, in its seeking, searching quality, elevated by a poignant sense of longing—for more knowledge, more time with which to study the plants, more freedom in their work, and more tools with which to see deeply" (p. 288).

Dry leads by example in *Waters of the World*, bringing this sense of delight to her telling of this history. She introduces us to the "magic trick" of scientific work, that "a great amount of work is applied to making a small bit of nature visible in a way it has never been visible before" (p. 81). It is hard not to reflect that the magic that Dry finds in science should be part of historians' work, too: a great deal of work, a sense of curiosity, awe, and searching that brings many ways of knowing together to reveal a part of human experience that has been difficult to see before. In an age that emphasizes research efficiency, funding scarcity, too many demands on researchers' time, and expectations of productivity, Dry's emphasis on a different approach reflects its own sense of longing.

Dry avoids becoming mired in the details of biography, placing each featured scientist not only within their historical context but within the institutions and governments that inform, fund, and build upon their work. Carrying readers between scales—from the close-up, for example, of Willi Dansgaard and his team analyzing ice core samples in a mass spectrometer to the Cold War backdrop that gave them access to massive core samples—*Waters of the World* connects the individual choices and quirks of scientists to the systems that shape them and the reception of their work. The scope of time and scale that Dry covers sometimes presents the book's greatest challenges; occasionally the sheer number of individuals and institutions feels unwieldy. But the book's expans-

ive reach also results in some of its greatest strengths. Each scientist's individual actions and choices build on, reinterpret, or ignore previous work; take place within the context of varying societies, institutions, and governments; and reflect both individual and cultural values and attitudes, some of which change over the course of a single career. This broad scope is central to one of the book's key purposes, "to show how the thing we today refer to quite casually as climate science is an amalgam of different ways of knowing the earth" (p. 273).

Despite the sense of compounding knowledge, *Waters of the World* is far from suggesting that such building has been efficient or inevitable. In fact, the messy unfolding of scientific work is essential to the book's argument. Dry takes us down intellectual rabbit holes alongside our scientists, both to dead ends and to unexpected discoveries. She reveals how knowledge uncovered in one context can have a completely different meaning in another, allowing researchers to make new connections. In doing so, Dry nudges readers in the sciences toward the benefits of interdisciplinarity, despite its challenges. She also shows how knowledge can be both gained and lost, and hints at how some forms of knowledge have been overlooked by professional scientists. Discussing Tyndall's work, for example, she notes that the shepherds who worked on the mountains where Tyndall researched had long noticed glacial changes, yet "it occurred to none of the small cadre who called themselves 'gentlemen of science' to ask them what they thought" (p. 24). These tantalizing hints of knowledge neglected by scientists, from that of local residents to indigenous knowledge, beg for further exploration. As she puts it, "We are inheritors of both more and less than we know" (p. 5).

Dry's emphasis on interdisciplinarity and the connections between different ways of knowing is a message, too, for historians, and perhaps especially for historians of science and the environment. Too much focus on the history of a single scientific discipline can obscure the larger, interconnected picture. By tracing histories of "water" rather than a specific scientific approach, Dry can demonstrate how seemingly disparate fields developed connections over time. For environmental historians, the use of "water" as the central element in this book may be a bit puzzling; environmental history has tended to focus on water in its liquid state, rather than subjects such as ice cores and atmospheric conditions. Here, too, Dry's work demonstrates the importance of thinking more creatively about our subject and considering a broader lens.

Dry seeks to provide useful context for the crisis of climate change we now face, and the urgency comes through clearly in the conclusion. There, Dry argues that historians have an essential role to play alongside climate scientists, and that any worries we might harbor about presentism are distractions in the face of this need: "we urgently need to think hard about the relationship between the present and the past. Any fears about how we are blinded by our present prejudices seem increasingly less significant than the risk of depriving ourselves of the best tools we can use for imagining the future" (p. 284). Historians, Dry says, are uniquely positioned to help both scientists and the broader public understand the value systems that have shaped our knowledge, and what assumptions those values have caused us to take for granted.

Yet in the midst of this urgency, *Waters of the World* reminds us all that the search for knowledge and the ability to imagine alternative futures requires more than single-minded focus. The book is also a call to follow the examples of these scientists and engage with the world with a sense of playfulness, wonder, and curiosity—and to take this relationship as seriously as we take our search for solutions.

If there is additional discussion of this review, you may access it through the network, at https://networks.h-net.org/h-environment

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