ADALBERT STIFTER-GESELLSCHAFT, WIEN/WIEN MUS.

Adalbert Stifter's depiction of the west Hungarian floodplains of the Danube, painted around 1841.

CLIMATE SCIENCES

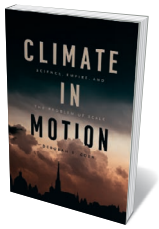
Imperial roots of climatology

Mott Greene applauds a history of how the Austro–Hungarian Empire shaped the field.

A world power ruled by the eccentric Habsburg monarchy, the Austro-Hungarian Empire was a force to reckon with for the frenetic 50 years preceding 1918. In the comprehensive, deeply researched *Climate in Motion*, historian of science Deborah Coen explores a lesser-known side of this unwieldy empire: its role as a crucible of modern climatology. Imperial scientists were a starry league, from meteorologist Julius Hann, who explored the relationships between prevailing wind, rainfall and mean temperatures, to geographer Alexander Supan, who established the global classification system for climate zones.

Coen probes imperial society and culture to understand why the Austro-Hungarian scientific establishment and government devoted such vast resources to meteorology and climate sciences. She finds the driver in the political and social need to shore up an uneasy multinational alliance that incorporated what are now the Czech Republic and Slovakia, as well as parts of Poland, Italy and Romania, among other states. Historians are fond of saying that science is embedded in the context of a specific time and place. Coen demonstrates this unequivocally.

The sweeping narrative spans three-quarters of a century, from about 1850 to 1925. Coen has mined many archives to trace the intersecting careers of more than a dozen major figures — meteorologists, botanists, geographers, geologists, painters and writers. Anton Kerner, for instance, saw how the geographical distribution of plants could help to determine climate history. Here, too, are Adalbert Stifter, an immensely popular novelist, travel writer and landscape artist; Emanuel Purkinyě, Czech pioneer of microclimatology; and Wilhelm Schmidt and Felix Exner, among the first to conduct lab simulations of atmospheric circulation and its modification by topography.



Climate in Motion: Science, Empire, and the Problem of Scale
DEBORAH R. COEN
University of Chicago Press (2018)

Two themes knit together what is essentially a collection of interconnected, roughly chronological essays. The first is the empire's struggle for unity in its diversity. The second is the problem of scale — an important element in climatology, where the range of interest runs from microclimates to global circulation.

The earlier Austrian Empire (1804–67) had suffered extensive territorial losses in a series of wars from the mid-eighteenth century to the Napoleonic era. Much of its energies were taken up with amalgamating the territory that remained. In 1867, a Habsburg compromise with the Hungarians created a larger, multi-ethnic collection of mainly Central European kingdoms under one imperial crown.

The new Austro-Hungarian Empire boasted more than ten major language groups, terrain ranging from alps to steppes, and transport and communication that remained rudimentary well into the nineteenth century. As Coen notes, successive governments under the long reign of Emperor Franz Josef I directed scholars to demonstrate that this all belonged under one flag. That was a potent issue in an age of national consolidation around linguistic units. The loose confederations of pre-unification Germany and Italy, for instance, could band together around a single national language and assertion of a common ethnicity. But this was not possible for the cultural melange that was Austro-Hungary.

Universities, institutes, museums, herbaria, observational networks, publishing houses and government bureaus settled on climatology, meteorology and the metaphor of atmospheric circulation as the scientific proof of the 'naturalness' of the empire. This group developed a science designed to show the dynamic interdependence of regions with wildly diverse topography, hydrography and vegetation. Just as

the wind from Austria brought rain to the Hungarian plain, and alpine snows fed the lands of the Danube, so each region was shown to provide some climatic essential that an adjoining one lacked.

These ideas infused society. They were picked up by economists including Emanuel Herrmann, who took climatology as a model for spatial analysis of the imperial economy. That concept, in turn, was developed by liberals such as the social democrat Karl Renner, who argued that diversity actually created unity, and that trade grew through exchange of excess goods between regions. Implicitly and explicitly, climatic interdependencies served as the foundation for political and economic oneness in a jostling, polyglot empire.

There was a closely linked emphasis on climate at different scales, micro to macro. Local topography and hydrography produce climates in areas ranging from a few kilometres to vast continental spans, and much of the work of climatology involves integrating these varied zones. But the focus on scale was driven by that overarching social, economic and political need for unity.

First, researchers studied conditions on very small scales, to satisfy local economic needs and political aspirations. These were then integrated into a larger imperial framework, especially in the data and maps of the huge, multi-volume series Climatography of Austria, published between 1904 and 1919 — a vastly more detailed descendant of German polymath Alexander von Humboldt's 1845 treatise *Cosmos*. Here, politics, rather than interfering, provided a rationale for doing a certain kind of science: descriptive, dynamic and focused on interdependence. That research was the seedbed of modern climatology. After the empire collapsed in 1918, catastrophically weakened by the First World War, the discipline was carried forward in Germany, Russia, Austria, Britain and North America.

There is a great deal more to this complex and reflective study. Coen examines how the empire promoted the popularization of science by leading experts while supporting research on the grand scale — an approach that stressed the patriotic, economic, cultural, even recreational utility of science. But the fact that climatology was born of a context of politics and policy, and was never far from them during its development, merits exactly this sort of examination as we wrestle with the ramifications of climate science today. ■

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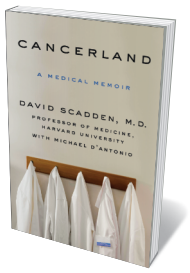
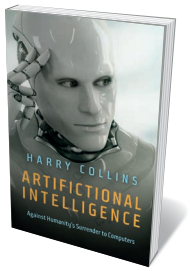
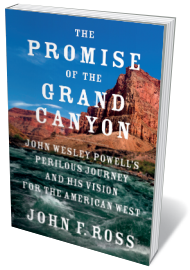
Books in brief



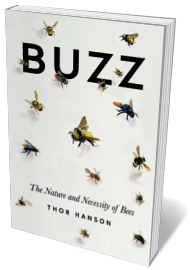
Cancerland: A Medical Memoir
David Scadden with Michael D'Antonio THOMAS DUNNE *(2018)*
Cancer is a foreign country with different norms, asserts David Scadden in this gripping medical memoir. A leading immunologist and oncologist, Scadden (with writer Michael D'Antonio) examines the disease's recent history through interconnected lenses. Patients' often harrowing experiences twine through the narrative on research and treatments, from chemotherapy, bone-marrow transplants and lumpectomies to CRISPR and immunotherapies. Scadden's own eventful life in the lab (not least, his co-founding of the Harvard Stem Cell Institute in Cambridge, Massachusetts) is a highlight.



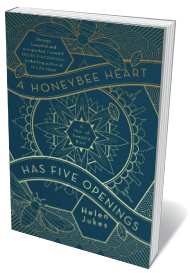
Artifictional Intelligence
Harry Collins POLITY *(2018)*
Sociologist of science Harry Collins has long focused on gravitational-wave physics (see *Nature* **542**, 28–29; 2017). Here, he shifts gears dramatically to examine pervasive existential fears over artificial intelligence and its perceived threat in the 'deep learning' era. Collins probes this idea trenchantly and in considerable detail. Pointing to computers' inability to factor in social context, master natural language use well enough to pass a severe Turing test, or wield embodied cognition, he argues that the real danger we face is not a takeover by superior computers, but slavery to stupid ones.



The Promise of the Grand Canyon
John F. Ross VIKING *(2018)*
In 1869, US geologist John Wesley Powell was the first to explore the Grand Canyon and its environs scientifically in an intrepid river descent. Historian John Ross shows how, beyond the derring-do, Powell championed sustainable resource use and was a key architect of federal science. As head of the US Geological Survey, he created an important ecological map charting water scarcity in the West that aimed (but failed) to temper congressional dreams of manifest destiny. He even foresaw the 1930s Dust Bowl crisis. A bold study of an eco-visionary at a watershed moment in US history.



Buzz: The Nature and Necessity of Bees
Thor Hanson ICON *(2018)*
For this natural history of the bee, biologist Thor Hanson wings far beyond the hive to explore bee species from "bumbles" to wool carders. Here are the proto-bee of 125 million years ago, evolved from a Cretaceous wasp ancestor; a Chilean desert bee of the genus *Geodiscelis*, with a grotesquely elongated tongue; and a bumblebee colony's haphazard array of tiny wax pots. Here, too, are the data on dwindling populations. Apiology, Hanson reminds us, is not just about the scientific buzz: bee behaviour has shed light on human issues from addiction to collective decision-making.



A Honeybee Heart Has Five Openings
Helen Jukes SCRIBNER *(2018)*
Joining the bright tide of cultural responses to all things apian (see *Nature* **521**, 29–30; 2015) is this subtly wrought personal journey into the art and science of beekeeping. Helen Jukes evokes both the practical minutiae of the work, and the findings of researchers who have illuminated bee ethology over the centuries, from François Huber to Eva Crane. Laced through are quietly lyrical musings over 'hive life' that see Jukes perceiving her colony variously as a "brain with a million synapses", an inner citadel built by master architects or the fount of an only partly decoded language. **Barbara Kiser**