

HISTORY OF SCIENCE

## Lots on Info, Not Always Accurate

Andrew Robinson

On the problematic relationship between information, knowledge, and wisdom, a comment by Albert Einstein seems to hit the mark. “Knowledge exists in two forms—lifeless, stored in books, and alive in the consciousness of men. The second form of existence is after all the essential one; the first, indispensable as it may be, occupies only an inferior position” (1). This is not among the numerous, well-chosen quotations that pack James Gleick’s *The Information*. But it encapsulates a major theme of his lengthy study: how humanity attempts to derive meaning—knowledge, and even wisdom—from the flood of available information. And, as Gleick emphasizes, not just since the advent of the World Wide Web but as long ago as the time of Shakespeare, when Robert Burton in his *Anatomy of Melancholy* complained of information glut.

Introducing his *The Mathematical Theory of Communication*, the founder of information theory, Claude Shannon, bluntly declared meaning to be “irrelevant to the engineering problem” (2). So there is an irony in the information revolution of the past half-century, as Gleick observes. “The birth of information theory came with its ruthless sacrifice of meaning—the very quality that gives information its value and its purpose.” Its implication was, “Forget human psychology; abandon subjectivity.”

Information is protean—as protean as writing itself. Gleick therefore has to cover a lot of ground if the book is to be comprehensive. He starts with the earliest scripts of Mesopotamia and China, the creation of alphabets, and the talking drums of Africa. After ranging through the 19th-century inventions of the difference engine and the electric telegraph as well as the 20th-century devel-

opments of information theory and the electronic computer and the decoding of the structure of DNA, he considers the current explosion of information on the Internet and the evolution of Wikipedia.

Along the way, the reader encounters a considerable amount of logic and mathematics, for instance in the discussions of mathematical randomness and the ideas of mathematicians Andrei Kolmogorov and Gregory Chaitin. Following his approach in earlier books (3–5), Gleick skillfully leavens this difficult material with revealing details from the personal

lives of such pioneering figures as Charles Babbage, Ada Lovelace, Alan Turing, Kurt Gödel, Norbert Wiener, and of course Shannon. But there is no getting away from the fact that parts of *The Information* will be a challenging read for almost all readers, depending on their particular area of expertise.

This is probably a virtue in an ambitious book of this kind—but only if the information imparted is accurate. Here, there is room for doubt. My own expertise lies in the history of scripts and writing systems. Gleick deals with this in the chapter “The persistence of the word,” some of which is seriously errone-

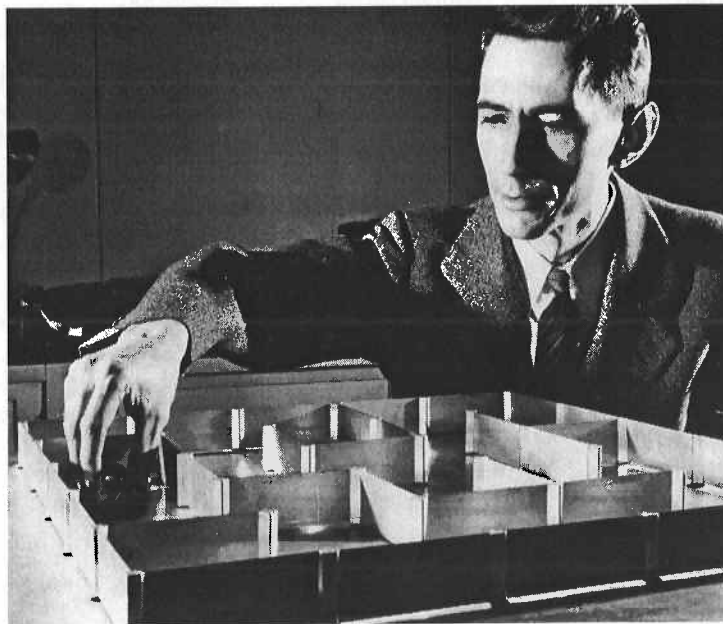
ous. One wonders where he obtained his ideas about writing systems, because he cites few authorities in this section. Indeed, his bibliography, which is extensive and crammed with recent references, contains only one book on the origins and evolution of writing systems, the revised, 1968 edition of David Diringer’s *The Alphabet*—a study first published in 1947 (6). Highly relevant works such as those by John DeFrancis, Denise Schmandt-Besserat, Hans Nissen *et al.*, and Stephen Houston (7–10) are alarmingly absent.

In discussing early scripts, Gleick claims that “there is a progression from pictographic, *writing the picture*; to ideographic, *writing the idea*; and then logographic, *writing the word*.” There is no such progression. In Egyptian hieroglyphics, pictography persisted for more than 3000 years and many pictograms represented both an idea and a word and sometimes also acted as a phonetic symbol. Gleick sees the Chinese script as the “most complex writing system” in the world, which unifies “an array of distinct spoken languages” and permits people “who cannot speak to one another [to] write to one another.” However, Japanese writing—based on Chinese writing (kanji), yet with the addition of a set of indigenous syllabic symbols (kana)—is unquestionably more complex. The supposed universal intelligibility of the Chinese script among different Chinese-language speakers is an ideographic myth long since exposed by DeFrancis and others. Gleick further claims that “alphabetical lists scarcely appeared until around 250 BCE, in papyrus texts from Alexandria.” But this overlooks the

famous abecedaries discovered at Ugarit (in modern Syria), which date from the 14th century BCE, soon after the probable development of the early alphabet in Palestine. And Gleick’s contention that “mathematics followed from the invention of writing” ignores the evidence of Mesopotamian clay tokens from as early as 8000 BCE, which suggest that counting and arithmetic long preceded the appearance of writing (around 3000 BCE)—a theory developed by Schmandt-Besserat.

Such errors inevitably, if maybe unfairly, dent the reader’s confidence in the book as a whole. Although I admire some of Gleick’s

**The Information**  
A History, a Theory, a Flood  
by James Gleick  
Pantheon Books, New York,  
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Shannon and his maze. A test for cybernetic rats.

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earlier works, I find it hard to avoid concluding that—enjoyable as some of *The Information* is—the author has been overwhelmed by the vast and amorphous nature of his subject. Hence, perhaps, that redundant “The” in the title, which tries vainly to stem the flood implied by a more obvious choice of title—the simpler “Information.”

#### References and Notes

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3. J. Gleick, *Chaos: Making a New Science* (Viking, New York, 1987).
4. J. Gleick, *Genius: The Life and Science of Richard Feynman* (Pantheon, New York, 1992).
5. J. Gleick, *Isaac Newton* (Pantheon, New York, 1992).
6. D. Diringer, *The Alphabet: A Key to the History of Mankind* (Hutchinson, London, 1947).
7. J. DeFrancis, *Visible Speech: The Diverse Oneness of Writing Systems* (Univ. Hawaii Press, Honolulu, 1989).
8. D. Schmandt-Besserat, *Before Writing* (Univ. Texas Press, Austin, 1992).
9. H. J. Nissen, P. Damerow, R. K. Englund, *Archaic Bookkeeping: Early Writing and Techniques of Economic Administration in the Ancient Near East*, P. Larsen, transl. (Univ. Chicago Press, Chicago, 1993).
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## CLIMATE CHANGE

# Between Two Poles

Cat Bohannon

It's a strange phenomenon: listening to the sound of running water can trigger salivation. One would expect it to be pleasant—Steven Pinker even argues we're evolutionarily driven to like the sound—but listening to Paul D. Miller's *Terra Nova: The Antarctica Suite* actually makes the listener a bit thirsty. The composition, commissioned by the Brooklyn Art Museum in 2009, is redolent with the sampled sounds of Antarctica's ice fields—cracks, groans, sluicing meltwater, crinkling shards, and newly freed icebergs in sloshing seas. Perhaps it's useful to have such an embodied reaction; as the accompanying film suggests, global warming threatens our already limited supply of fresh water. Choosing aesthetic over pedagogy can breed pedagogy, nonetheless. Thirst is a subtle way, then, to anticipate apocalypse.

#### The Book of Ice

by Paul D. Miller

Mark Batty, Brooklyn, NY,  
2011. 128 pp. \$29.95, C\$34,  
£21. ISBN 9781935613145.

Four years ago, Miller—a critically lauded composer and cultural theorist, better known as DJ Spooky—hired a decommissioned Russian naval ship to carry himself, a crew, and no small amount of high-tech recording equipment to Antarctica to record its ice fields. The ship, the *Akademik Ioffe*, now specializes in hydro-acoustic research. In Miller's case, that research would produce no papers in peer-reviewed journals but instead a multiyear, multigenre suite on climate change and the public imagination: a multimedia concert, a remix of Frederick Cook's scandalous 1912 film on the North Pole, installations at various biennales, and innumerable performances and lectures.

The latest node in that network of production is *The Book of Ice*, Miller's two-dimensional meditation on Antarctica. Not to be limited to a single genre, the book involves essays, graphic design, timelines, maps, propaganda for imaginary political movements (the agents of which may or may not be human), archival photos of Antarctic exploration, and even QR codes to access film and music online. Physicist Brian Greene wrote an introduction as multifarious as the book itself, ranging from the physics of ice to phase transitions in string theory. In a nod to climate change's cultural ties to science fiction, Miller even includes an interview—bewilderingly, a critic interviewing him—on Afrofuturism.

All of this, of course, is quite maddening for the average scientist. Where are the accounts of the latest in climate science? Ice-core samples? Where are the tutorials? What are we learning from all this art-doing and art-musing?

While many will learn some basic science about Antarctica and climate change from Miller's projects, what's most valuable here is a portrait of how the public imagines Antarctica and its role in a warming planet.

Rather than pedagogy for a middle-school science classroom, we find an aesthetic tutorial on how data from perfectly well-meaning climate scientists are set adrift in the soup of public fears, hopes, soundbites, history, and cultural orientations. And lest we forget, we're included in that “general public”: the vast majority of *Science*'s readers aren't climate scientists. For many, our only advantage is a heightened suspicion of any graphs and statistics that aren't properly documented.

The science included in the book is often ensconced in aesthetic gestures and sly cul-

tural references. For example, Miller writes that although ice is “based on the molecule of water ... many of the main qualities of ice are controlled by the hydrogen bonds between oxygen and hydrogen atoms. Got it?” No. We don't. Let's be honest: Wikipedia aside, many scientists who work above the molecular scale can't provide a definition of hydrogen bonding. Miller's winking at us here, somewhere between a joke and self-consciousness.

That play between the feeling of knowing and actual knowledge is sprinkled throughout the book in fascinating (and ultimately aesthetic) ways. For example, the figure “Risks and impacts of global climate change” colorfully depicts risks intensifying with increased temperature. By including numbers, it seems to impart scientific knowledge. However, the

metrics are undocumented, and on closer examination, the illustration actually conveys nothing more than a general sense of impending apocalypse, marked somewhere between the years 2025 and 2075 by a gradual shading from yellow to red.

Remember the U.S. government's constant Orange Alert for a terrorist threat and the resulting widespread, directionless panic? That seems precisely how the general public understands climate change. We see that the scientific community is largely in agreement that it's happening, and many are even willing to admit the possibility of human influence, but we have no more than a fuzzy idea how and why it occurs. We stretch between two poles: the recent past and a terrifying future, robbed of the sense of agency real knowledge provides. Into that howling absence, we pour fantasies about merry penguins and shifting glaciers, mutely divide our garbage from recyclables, and scan the latest graph as desperately and aimlessly as one might read a horoscope.

Miller is at his best here visually and audibly—his introduction and interviews are just passable. The archival photographs of Antarctic expeditions are a treasure, as are many of the graphic designs that stem from his earlier *Terra Nova* composition. The propaganda posters for the “Manifesto for a People's Republic of Antarctica” are also delightfully mid-20th century (picture penguins in military formation under a stream of planes—Uncle *Aptenodytes* wants you). As a whole, *The Book of Ice* stands as a quirky meditation on Antarctica and its role in climate change.

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A QR code for sampling.