

SCIENTISTS' Nightstand

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ALSO IN THIS ISSUE

THE TETRIS EFFECT: The Game That Hypnotized the World. By Dan Ackerman. • TETRIS: The Games People Play. By Box Brown. **page 54**

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Deconstructing Disaster

THE CURE FOR CATASTROPHE: How We Can Stop Manufacturing Natural Disaster. Robert Muir-Wood. 368 pp. Basic Books. 2016. \$29.99.

LOVE CANAL: A Toxic History from Colonial Times to the Present. Richard S. Newman. 328 pp. Oxford University Press. 2016. \$29.95.

Casual observers of catastrophe continue to distinguish between human-caused and natural disasters, but in either case consider them to be unforeseeable, out-of-nowhere events. Two recent books—*Love Canal*, by Richard Newman, and *The Cure for Catastrophe*, by Robert Muir-Wood—might change some minds.

Although oil spills and train derailments that release hazardous substances are clearly the unintended results of societal choices, other well-publicized catastrophes generally understood to be “natural” disasters should be seen in the same light. The flooding of New Orleans during Hurricane Katrina, for example, or the 18,500 deaths from the compounded disasters in Tohoku, Japan, in February 2011, or the deaths of 5,000 school children in China following the 2008 Sichuan earthquake—these events were not so-called acts of God. (The term is still used in contract law to designate an unanticipated calamity.) In the 20th and 21st centuries, poor political and economic choices have compounded the effect of natural events and put people unnecessarily at risk.

These two books tell very different stories about disaster, but in the end they mutually reinforce our recogni-

tion of the critical nature of regulation, the role of citizen science, and the important part played by cultures and institutions in mitigating risk. Although we're accustomed to defining the critical juncture of a disaster as the moment the event affects local residents, in reality some of the most important decisions happened long before, when decision makers set safety standards and building codes and implemented recovery frameworks. At the local level, residents can and should participate as active partners in formulating disaster mitigation plans, instead of being passive recipients of them. Everyday citizens can collect, analyze, and interpret data critical for their own health and survival. For example, participants in a global Web 2.0 project called Safecast share measurements of environmental radiation and other pollutants. Finally, local residents can create safety cultures that reduce disaster risk, while governments set up institutions to smooth recovery processes and ensure equity.

Newman's well-written, deeply researched book tells the full story of the chemical disaster at Love Canal, a suburban neighborhood of Niagara Falls, New York. Newman, a historian specializing in environmental and early American history, begins the story centuries before Love Canal became synonymous with ecological catastrophe. He describes the initial Western exploration of the area during the 17th century, then focuses intently on the dreams of late-19th-century visionary William Love, for whom the canal was named. Love envisioned generating electricity for a planned model community (to be called, naturally enough, Model City) by harnessing the power of water drawn from nearby Niagara Falls through engineered waterways.

When that exercise in futuricity fell apart, it left behind a clay-lined ca-



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nal that was ideal for the area's next phase of use: answering the electrochemical industry's need for a dumping ground. In 1942 Elon Hooker, civil engineer and captain of industry, began entombing some 22,000 tons of chemical waste in the premade canals. It was a legal move at the time, as no laws covered toxic waste disposal (or worker safety, for that matter) in the first half of the 20th century. Chemicals placed in the ditch included benzene, dioxins, and ten other known carcinogens. Sealing the dump in 1953, Hooker Chemical Company officers believed that as long as the site was left alone, the clay would prevent any waste from escaping.

Yet the local school board was already eyeing the land in 1952, and the next year it purchased the site for \$1 from Hooker Chemical. When the school board had first approached Hooker about the property, the company dutifully warned them about the site's hazardous contents. Newman notes that Hooker officials also pressed for assurances from the board that, should plans for a subdivision move forward, "mention of the chemical dump . . . would be included in all subsequent transactions between the city and developers, and then between developers and homeowners." This, Hooker officials hoped, would absolve them of liability. The board agreed to

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the stipulation, but failed to follow through. After using some of the land for two schools in the early 1950s, the school board sold unused land to housing developers in the late 1950s, despite renewed warnings from Hooker Chemical executives and attorneys.

Things went downhill from there. Paint peeled off homes. Children played pop rocks, throwing phosphorous-laced stones at the ground after discovering the rocks would explode on impact. People complained of foul odors and dying vegetation. One family, the Schroeders, found that its sunken fiberglass swimming pool had risen from its usual position by two feet, pushed up by chemicals flooding into the groundwater. A number of residents noticed health changes in their families, including seemingly high numbers of miscarriages, respiratory problems, and cancer. As the community lost the rhythms of normal life, the women who lived there, led by people such as Lois Gibbs, mobilized into a grassroots movement in the 1970s. Pushing hard against the weak regulation that had allowed the

disaster to happen in the first place and not content with small-scale measures (such as limited evacuations), residents reached out to find regional and national allies.

Political action around the Love Canal event, which is readily classified with "human-made disasters," gained steam just when public attention was beginning to galvanize around issues of environmental justice. Newman shows how national political figures used Love Canal as a policy window through which they could develop the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (or CERCLA, known more colloquially as Superfund), which pushed responsibility back onto private developers. Even firms such as Hooker, which had followed the rules when it disposed of the chemicals, were liable to help clean up the site later. Eventually all of the residents from Love Canal, even those not living directly over the disposal sites, were moved out, and the area was off-limits for decades as it was remediated. Despite the tremendous public concern about this environmental disaster, epidemiologists and scientists have drawn mixed conclusions from peer-reviewed health studies of former residents. Some scientists, such as cancer researcher Beverly Paigen, argued in the late 1970s that residents clearly suffered adverse health effects.



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But studies carried out by the Centers for Disease Control and Prevention in the early 1980s using blood samples found almost no chromosomal aberrations between residents and nonresidents. As with the Chernobyl disaster, outsiders cannot absolutely agree on the scope of the damage to those exposed to toxic chemicals.

The Love Canal story illuminates several broader issues, including the concept of putting areas considered of lesser “quality” into service for disposable land uses or as sacrifice zones for industry. When embarking on controversial new projects, developers and bureaucrats alike regularly look for land that has already been degraded or poorly used. The story also underscores the need for citizen advocacy and pushback on land-use plans. As a diverse group of scholars—from political scientist Greg McAvoy to anthropologist Hugh Gusterson, and including myself—have argued, opposition that used to be pejoratively labeled “not in my back yard” (or, NIMBY) typically catalyzes better public policy.

Muir-Wood’s narrative is choppy than Newman’s, and it breaks from the linear sequence common to historical and academic writing. Instead, the author adopts a science journalism approach, skipping from disaster to disaster, time period to time period, to get his point across. Throughout the book, he builds on the argument that disasters are political: “Disasters consume wealth, depreciate land values, and threaten governments. . . . From Simón Bolívar to Fidel Castro, leaders have understood the need to outwit catastrophes in order to maintain their authority.” Among other things, the political sphere affects the nature of the built environment as well as the accepted level of risk tolerance. “Disasters are determined,” Muir-Wood observes, “by what we build, where we choose to live, how we prepare, and how we communicate warnings.” He then links a variety of catastrophes over time and regions, with examples ranging from a Renaissance-era earthquake in Portugal to modern-day catastrophes such as the 2010 Chilean earthquake and the 2011 Japanese earthquake and tsunami.

He illustrates how some low-cost mechanisms—such as disaster-response education—have shown success in communities, such as Kamai-shi, Japan, during the March 11, 2011,



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tsunami. There, a professor had developed educational programs to convey lessons learned from some successful evacuations immediately preceding the 2004 Indian Ocean tsunami.

Although a number of regions, in-

clude casualties. Nations, however, do not need money to save lives: Cuba’s proactive civil defense program has reduced hurricane casualties to close to zero. Rather than relying on high levels of government spending, Cuba uses

Regulatory and market choices well before the event create the necessary conditions for disaster.

cluding Chile, San Francisco, and Wellington, New Zealand, have invested in upgrading their building infrastructure, Muir-Wood argues that we all too often construct buildings to withstand only the latest disaster. This approach can be especially hazardous in areas prone to multiple kinds of catastrophe—for example, earthquakes and wildfire, as in certain parts of California, or earthquakes and typhoons in Japan.

Especially among developing nations, where regulation is weak and construction often unsupervised, we see the same problems: “bad design, bad execution, bad reinforcing, bad concrete.” Muir-Wood finds that wealth and urbanization—that is, offshoots of economic development—re-

public education, good communication systems, and community mobilization to prepare the nation for storms.

The book points out that although the insurance and re-insurance markets are often held up as examples of how to mitigate damage, private insurance is actually playing a diminishing role in the United States. Instead, the federal government is paying more and more of the compensation provided to victims of disaster. As I have observed in my own research, there are other ways to reduce damage: Social capital and social ties are critical, with neighbors often serving as emergency first responders, and local nongovernmental organizations saving lives and accelerating recovery. Although reinforcing existing cohe-

sion and building new social networks takes a great deal of time, these tactics are generally far cheaper than physical infrastructure projects. In the end, to reduce casualties and improve response, a bottom-up, grassroots disaster culture will need to work side by side with top-down, forward-thinking institutions willing to enact substantial change. No government pronouncement or plan will be effective without buy-in from local residents; at the same time, neighborhoods and communities rely on the resources held by the central government.

Both books recognize an important lesson that economic historian John Singleton offers in his recent book *Economic and Natural Disasters Since 1900: Disasters—even those typically categorized as unpredictable—happen during times of crisis. Although we typically notice only a crisis’s trigger moment and its tragic aftermath, in reality regulatory and market choices well before the event create the necessary conditions for the problem. And so the cycle continues. Whether by filling in marshland, developing coastal properties, or disposing of waste in convenient but unsustainable ways, we continue to place ourselves in harm’s way.*

Yet as time moves on, more tools are available to predict and mitigate risk. Muir-Wood recounts how in the wake of Hurricane Andrew in 1992, which pushed nine insurance companies into bankruptcy, insurers developed catastrophe models based on “100,000 years of synthetic catastrophic histories”; they used these models to calculate insurance prices and establish how much to hold in reserve in the event of a year of serious losses. As Muir-Wood points out, “The technology that protects the markets can also protect people.” “Political leaders,” he adds, “will increasingly be expected to account for latent disaster deaths and losses before they happen.” This kind of modeling is, in a sense, just another way to learn from the past. Sharing and contextualizing disaster narratives are others. Hopefully *Love Canal* and *The Cure for Catastrophe* will help readers think more carefully about the downstream consequences of our often shortsighted choices.

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Soviet Blocks

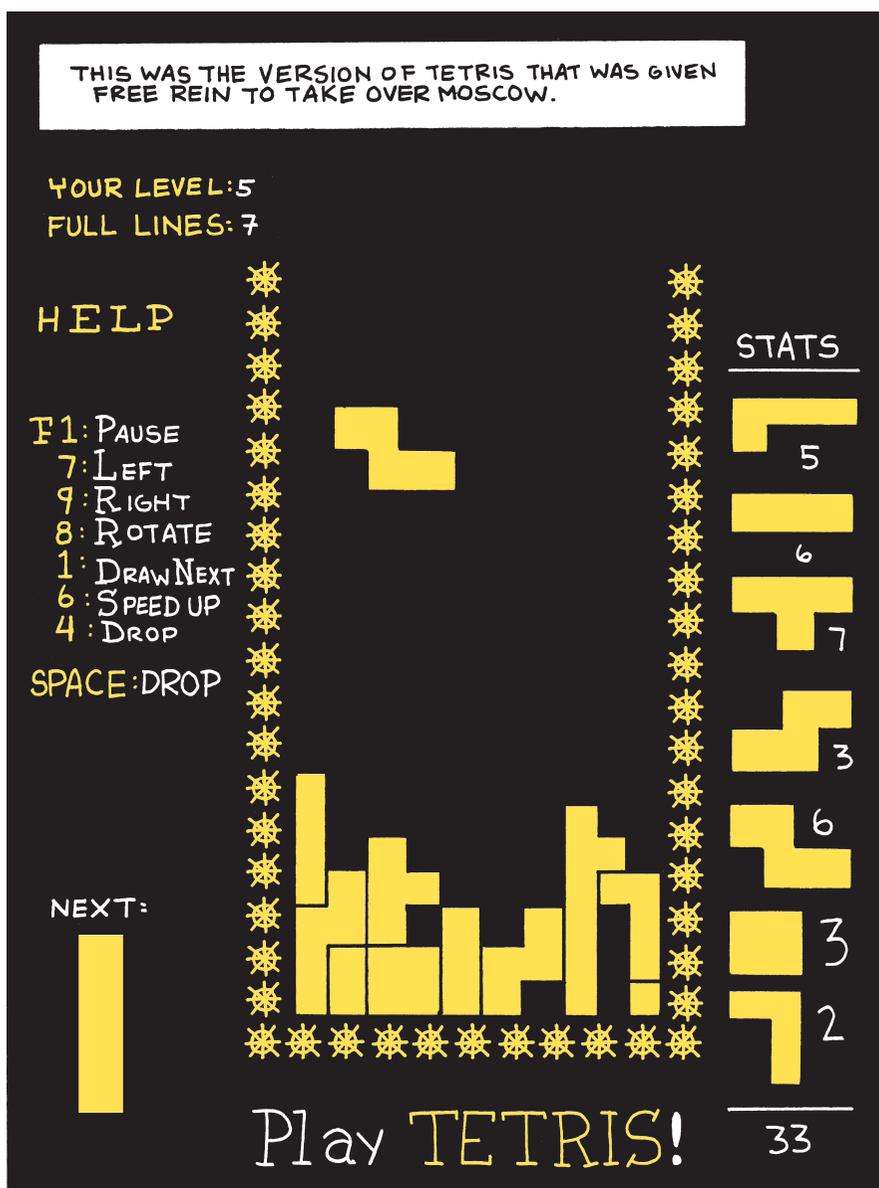
THE TETRIS EFFECT: The Game that Hypnotized the World. Dan Ackerman. 272 pp. Public Affairs, 2016. \$25.99.

TETRIS: THE GAMES PEOPLE PLAY. Box Brown. 256 pp. First Second, 2016. \$19.99.

What is it about Tetris? How did this inspired little game, which started out as a piece of freeware designed to run on the Russian Электроника 60 Microcomputer (*Electronika 60* in English), transform

into an international bestseller generating billions of dollars? Thereby hangs a tale—and 30 years on, two books have appeared to tell it. *The Tetris Effect*, by technology journalist Dan Ackerman, and *Tetris*, by Ignatz Award-winning cartoonist Box Brown, hit bookstore shelves within months of each other. Yet each ushers readers along a distinct and enlightening path.

The story of Tetris is complex, spanning the worlds of technology, psychology, entertainment, politics, and business. Still, the core narrative is in some ways familiar. A videogame phenomenon emerges maybe once or



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