ANNALS OF A WARMING PLANET

HOW THE REFRIGERATOR BECAME AN AGENT OF CLIMATE CATASTROPHE

The evolution of cooling technology helps to explain why supposed solutions to global warming have only made the situation worse.

By David Owen

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Ice harvesting on Bantam Lake, in Connecticut. Harvesters in the state and elsewhere once packed lake and river ice in sawdust and shipped it as far away as India and Australia. Photograph courtesy Bantam Historical Society

A couple of years ago, in spring, my wife and I took our dog for a walk near Bantam Lake, in northwestern Connecticut, a few miles from our house. In swampy woods on the lake's northern shore, we noticed a double row of lichen-spattered concrete pillars, each one four or five feet tall. The rows began at the edge of the water and extended maybe two hundred yards into the trees. Nearby was a narrow canal filled with water and dead leaves, crossed in several places by wooden bridges that looked like shipping pallets. In a rectangular clearing beyond the inland end of the canal, we saw two parallel strips of concrete, hundreds of feet long and more than a hundred feet apart. They made useful walking paths over the mucky ground.

I learned later that we had seen ruins of the Berkshire Ice Company, which ran a harvesting operation on the lake a century ago. Each winter, at that site, Berkshire

employed a hundred and forty men, many of whom lived in bunkhouses. They worked from three in the morning until six at night, seven days a week. Teams of horses pulling sleigh-like "scorers" cut grid lines in the ice, and men with long handsaws followed the lines. The ice, to judge from old photographs, was more than a foot thick. The concrete pillars that we saw supported a conveyer belt. It moved freshly cut blocks away from the lake to an immense icehouse, which stood on the concrete footings that we had used as walking paths. The icehouse held sixty thousand tons. Train cars could be loaded from two sides of the building at the same time.

According to a historical booklet published by the White Memorial Foundation, the conservation nonprofit that owns the land now, the harvest typically began each year in late November, and ended in mid-March. I went back to the same spot several times in recent months, beginning shortly before Thanksgiving, and saw no ice at all, much less enough to support men and horses and heavy equipment. Many of the homeowners had pulled their docks onto the shore for the winter, but the entire lake was open water. On the afternoon of December 16th, the temperature was sixty-one degrees.

Changes in the Earth's climate in recent decades have been both frighteningly swift and deceptively slow. Once in a while, though, you notice something that knocks you over. Many unsettling transformations are concealed within 1.5 degrees Celsius.

Ice harvesting on Bantam Lake ended in 1929. The proximate cause was a fire that destroyed the icehouse, but the business was doomed anyway, by the rise of artificial ice production and the growing popularity of a new consumer product: the household refrigerator. Kelvinators, General Electric Monitor Tops, and other early residential models were crude and expensive, but they and their successors eventually displaced icehouses, horse-drawn scorers, and overworked sawyers. The evolution of cooling technology can be viewed as a parable of our unfolding climate catastrophe, partly because the technology has directly contributed to the crisis, but mainly because its history suggests a counterintuitive explanation for why combating global warming has proven to be so hard, and why some of our putative solutions are actually making our problems worse.

The end of ice harvesting on Bantam Lake, in 1929, corresponded with a rise in artificial ice production and the growing popularity of the household refrigerator. Photograph courtesy Bantam Historical Society

In temperate places, regularly using cold to preserve food first became practical in the early decades of the nineteenth century, when harvesters in Connecticut and elsewhere began packing lake and river ice in sawdust and shipping it as far away as India and Australia. Large-scale artificial production followed. My mother,

who is ninety-two, calls her refrigerator her icebox, because when she was a little girl that's what her parents had: a zinc-lined food-storage cupboard that didn't plug into anything and sometimes dripped meltwater onto the kitchen floor.

The first electric refrigerators were loud, poorly insulated, and occasionally dangerous, and they cost more than some new cars. As the technology improved and prices dropped, though, they upended multiple industries. Iceboxes and neighborhood icemen gradually disappeared, of course, but the production, packaging, distribution, retailing, purchasing, and consumption of food were transformed, too. At around the time that the Bantam Lake ice business ended, Clarence Birdseye, an American businessman and inventor, introduced flash-freezing technology, and the tiny freezer compartments of early household refrigerators grew to make room for Birds Eye peas and spinach, and also for the aluminum trays that set my father's teeth on edge when he pulled their handles to free ice cubes for his cocktails.

My grandchildren dispense ice cubes for themselves by pressing a glass against a lever in their freezer door. My wife and I don't have one of those, but we do have a refrigerator-freezer in our kitchen and another in our basement, along with a full-size stand-alone freezer. We are by no means the most well-equipped people we know; we don't have a temperature-controlled wine-storage cabinet, an under-counter refrigerated beverage drawer next to our dishwasher, or a third refrigerator, in our garage. Even crummy motel rooms now have refrigerators (always running, seldom used). I sometimes buy gas at a big new Cumberland Farms, which, like many modern gas stations, has more refrigerated display space than the A. & P. where my mother did her grocery shopping when I was little. The small grocery store near my house has an entire refrigerated room just for beer.

Refrigerators use compressors, condensers, and coils filled with volatile compounds to transfer heat from inside to outside; this same innovation made air-conditioning possible. When I was born, in 1955, air-conditioners in houses (and cars) were rare; today, in almost all of the United States, they're close to universal. My mother's father stayed semi-comfortable during Kansas City summers in the thirties and forties by moving a bed into his screened porch and wearing seersucker suits to work. Now it's possible to pass entire days without encountering air that hasn't been artificially cooled—and, once you get used to cooled air, its absence can feel unendurable. (In 2011, a retired Army general estimated that the Defense Department was spending a little over twenty billion dollars a year to provide air-conditioning for U.S. forces in Iraq and Afghanistan.)

The use of cooling technology is growing worldwide. China now accounts for close to half of global air-conditioner purchases and roughly three-quarters of global production; in Dubai, where life during much of the year would be next to impossible without air-conditioning, hotel swimming pools are chilled. According to a report published in 2018 by the International Energy Agency, refrigeration in 2016 accounted for about six per cent of the world's energy consumption, and space cooling accounted for about eight per cent. In the same report, the I.E.A. predicted that worldwide energy use by air-conditioners would triple by 2050, "requiring new electricity capacity the equivalent to the combined electricity capacity of the United States, the E.U. and Japan today." Energy use by refrigerators is on a similar upward path.

Much of the world's recent growth in cooling capability has been an adaptive response to global warming. The problem is self-perpetuating, because the electricity that refrigerators and air-conditioners run on is mostly generated by burning fossil fuels. There are other climate impacts. Hydrofluorocarbons—which, for decades, have been the volatile compounds circulating inside most new cooling equipment—were widely adopted as refrigerants because they don't have the same destructive effect on the Earth's ozone layer as their immediate predecessors, chlorofluorocarbons. But hydrofluorocarbons are greenhouse gases with hundreds or thousands of times the warming potential of carbon dioxide. Last year, the Environmental Protection Agency adopted a rule phasing down their production and use in the United States by eighty-five per cent over the next fifteen years. But vast quantities are still being manufactured. Leakage is a common problem, and not only when old refrigerators and air-conditioners end up at the dump.

The most widely embraced strategy for slowing the warming caused by cooling technology is to increase the energy efficiency of new refrigerators and air-conditioners. In a 2011 report, the U.S. Department of Energy estimated that its new efficiency standards for refrigerators (which went into effect in 2014 and are currently being updated) would "save the nation almost four and a half quadrillion BTUs over 30 years. That's three times more than the total energy currently used by all refrigeration products in U.S. homes annually. It's also the equivalent amount of energy savings that could be used to power a third of Africa for an entire year." The I.E.A., in its 2018 report, argued that, through "stringent minimum energy performance standards and other measures such as labelling, the average energy efficiency of the stock of ACs worldwide could more than double between now and 2050." Implementing those changes, it said, would significantly reduce the need for new electricity infrastructure, flattening the curve of future energy demand.

This strategy sounds both logical and doable. But history suggests that it won't succeed. Artificial cooling caught on initially because it was more efficient than packing lake ice in sawdust and loading it onto trains and ships. During the decades since then, the efficiency of cooling machines has increased steadily and spectacularly. Indeed, the stunning growth in cooling machines' energy consumption has been paralleled, from the beginning, by equally stunning growth in their energy efficiency. Some of the biggest gains began in the mid-nineteen-seventies, in the aftermath of the Arab oil embargo, but efficiency improvements had preceded the crisis, and they continued long after it had passed. In 2010, the World Economic Forum estimated that the average refrigerator for sale at that time used only a quarter as much energy as a typical 1975 model, yet had twenty per cent more storage capacity and cost only forty per cent as much. Today's refrigerators and air-conditioners are more efficient still.

If increased energy efficiency makes over-all energy consumption go down, as the I.E.A. and the D.O.E. suggest, then why does our warming problem keep getting worse? Defenders of efficiency as a climate strategy argue that the amount of energy our machines use today would be vastly higher if our machines were as inefficient as they were ten or twenty or fifty years ago. But the flaw in that argument is easy to see. If the only refrigerators we could buy now were thirties-era G. E. Monitor Tops, Cumberland Farms wouldn't have an entire wall filled with chilled soft drinks and drinking water (in minimally recyclable plastic bottles, which themselves would not exist without the efficient refrigerated display cases that keep them cold). Similarly, if the only way to fly from one coast to the other were to hitch a ride with the Wright brothers, you wouldn't travel to California for Christmas.

The I.E.A. says that if we successfully implement what it calls an "Efficient Cooling Scenario," by optimizing the energy efficiency of our cooling machines, we could save almost three trillion dollars by 2050. If we really do that, though, we will have three trillion to spend on something else, and whatever we spend it on will inevitably have climate consequences of its own. The history of civilization is, in many ways, the history of accelerating improvements in energy efficiency. Extracting greater value from smaller inputs is how we've made ourselves rich; it's also how we've created the problem that we're now trying to address with more of the same. Making useful technologies more efficient makes them cheaper, and as they become cheaper we use them more and find more uses for them, just as adding lanes to congested highways makes driving more attractive, not less. In 2011, the D.O.E.'s forecasters presumably didn't anticipate that improvements in energy efficiency would make it increasingly economical to power and cool the server farms that mine and manage cryptocurrencies. The correlation between growth in efficiency and growth in consumption is not accidental.

My wife and I lived in Connecticut without air-conditioning for thirty-seven years. The summers are getting hotter, though, and we're both in our sixties and therefore more susceptible to heat-related health problems. In December, we installed a modern four-zone air-conditioning system in our house. Because the system is so energy efficient, a consortium that includes the state and two electric utilities covered part of the cost. The transaction encapsulates the main flaw of America's principal response to climate change: we increased our annual energy consumption by making a luxury addition to our house and got credit for helping to save the world.

On January 2, 2022, I went back to Bantam Lake and saw two pickup trucks and a boat trailer parked near the state launch ramp. The day was too cold for water skiing but warm enough for dog walking in just a sweater. A little later, I spotted the boat, with two guys in it. They were probably fishing, or maybe they were just tooling around. There was no ice anywhere, not even on the puddles in the parking lot.

David Owen has been a staff writer at The New Yorker since 1991. He is the author of "Volume Control: Hearing in a Deafening World."

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