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Editor's Journal

Deus ex Technologica

A year ago, COVID-19 seemed like a global crisis with a technological solution. Effective vaccines were being rolled out, which, combined with monoclonal antibodies and other treatments, reduced transmission, symptomatic infections, and the death rate. But now, nearly two years into the pandemic, we are watching the omicron variant, which mutated in ways that appear to help it evade vaccines and possibly treatments, make its way around a world where only some people had access to some vaccines, and others chose not to get them.

"Maybe we underinvested in research on human behavior," said Francis Collins, interviewed by *PBS NewsHour* on his retirement after more than a decade at the National Institutes of Health. "I never imagined a year ago, when those vaccines were just proving to be fantastically safe and effective, that we would still have 60 million people [in the United States] who had not taken advantage of them...."

Today, our collective belief in the *deus ex technologica* seems tragically misguided. And our experience with COVID-19 should make us reexamine other problems that we've framed as technological—climate change being a prime example. Global warming has long been portrayed as a technological and financial dilemma—if only we invented enough low-carbon energy sources and had enough money to string the wires. But if we carefully pick apart our underlying assumptions, we may find lessons for future policymaking: Could more systematically incorporating the human dimensions of both technology and the challenges we face speed up our efforts? In other words, could deliberately connecting our technology with our messy humanness make us better problem solvers?

As globalized phenomena, the pandemic and climate change have similarities, explains Jeremy Farrar, leader of the United Kingdom's Wellcome charitable foundation, during his interview in this issue. Both problems force governments to balance the domestic pressures of tending only to their own citizens with international responsibilities, such as making vaccines available everywhere. To Farrar, our common global future requires that we build institutions to handle such "transnational challenges." "We're either going to have to find ways to work together or we will fail together,"

he says, "whether for pandemic or climate change, inequality, or access to energy and water."

The need for globally oriented institutions is echoed in an article by Carol Dumaine, who argues that the experience of the pandemic reveals the need to reframe national security away from hostile states and human aggressors to address global public health, including children's and young adults' mental health. "The pandemic can be seen as a harbinger of a new security landscape. More and more often, security issues are global and environmental and cannot be adequately addressed by individual nations acting on their own."

As the country heads into an uncertain winter, *Issues* editors have collected a series of articles examining how human considerations around technology, as well as institutions of governance, can offer new insights for policymakers working on climate. Delving into the intricacies of energy access, climate adaptation, biodiversity, religion, and California's wildfires, our contributors show how thinking deeply about the human side of our dilemmas can inspire new policy choices, address inequities, and possibly even solve seemingly intractable problems.

Consider, for example, Igbatoro, an impoverished Nigerian agricultural village that was connected to a solar mini-grid in 2017. Igbatoro's grid was a promising part of an extraordinary global effort to provide energy to 1.2 billion people, reducing carbon emissions and promoting sustainable development. But without loans for sewing machines or other investments in equipment, the town's residents couldn't use the electricity to raise their incomes, which meant they couldn't pay their electric bills. Within four months, every home had disconnected from the grid. By contrast, another village, Kigbe, spent three years preparing for the arrival of a solar mini-grid and then put it to work running water wells, a clinic, and an array of local businesses that continue to thrive. "The challenge of providing energy access goes beyond passing electrons through wires," write Michael Dioha, Norbert Edomah, and Ken Caldeira. Instead, policymakers must fix the disconnects between grids and communities,

inviting citizen engagement and facilitating economic empowerment. Bringing electricity to the 700 million people without it in sub-Saharan Africa will require not only wires but a willingness to see beyond lightbulbs—and into people’s lives and ambitions.

In the past decade or so, India brought electricity to half a billion people but must now quickly reduce its reliance on coal while continuing to lift its citizens out of poverty. Kartikeya Singh explores how giving the country’s massive energy bureaucracy a new mandate could create a greener grid and lay the foundation for a more sustainable economy. “There’s a modern tendency to see bureaucracies as obstacles, as plodding second cousins to entrepreneurialism,” Singh writes, “but their very persistence speaks to the power of people organized around common goals—whether that’s running pipelines, mining coal, or cleaning up pollution. And although much of the rhetoric around addressing climate emissions has focused on things we don’t have—technology, money, time—the people who can make it happen are already here.”

Figuring human priorities into climate planning could even save US taxpayers money, write Jennifer Helgeson and Jia Li. They argue that the benefit-cost analysis used by the Federal Emergency Management Agency to fund community resilience projects should be expanded to account for the ways communities understand themselves. When the town of Port Orford, Oregon, started to plan for tsunamis, they were surprised to learn that the “high-tech” solution of reinforcing town buildings would be more expensive and provide fewer benefits than building footpaths to high ground—which could also become a tourist attraction and help residents flee other hazards such as earthquakes. But the format of benefit-cost analysis prevented it from capturing the broader interconnected impacts that made footpaths the better choice. “We believe that allowing a wider range of inputs into standardized benefit-cost analysis will help reduce costs and lead to better planning decisions—helping public money go further and have greater impacts,” they write.

These new, more human approaches to problem-solving are not only a recognition of the limits of technology and the benefits of social science—they’re also a realization that previous beliefs about strategies to successfully reduce emissions have not come to fruition. As David Simpson writes in his reconsideration of the social cost of carbon, in the 1990s many economists held the view that human ingenuity would compensate for resource depletion and environmental degradation as it had in the past, painlessly solving the problem of carbon emissions. This optimistic scenario permeated policy, but 25 years later Simpson wonders whether “the unknown

and unknowable risks of climate change argue for caution.”

Although the ongoing pandemic, coupled with spotty progress on climate, has brought about a wave of pessimism that pervades media, social media, and even casual conversations, we might find ways out of this doom spiral by reconceiving innovation’s causes and effects. I was surprised to read Vannevar Bush, generally lauded as the architect of science’s optimistic frontier, fretting quite convincingly in 1955 that humanity is “headed for catastrophe unless he mends his ways and takes thought for the morrow,” as Bush imagined the consequences of splitting the atom and “engineering viruses.” His letter is a reminder that we’ve been through bleak times before, but we often rewrite them in hindsight.

One of Bush’s great strengths was that he was a “policy entrepreneur” who created a powerful (if simplified) model of innovation, writes William Bonvillian in his article on building US industrial policy. “The linear model’s intuitive appeal—that innovation is produced like a car or a toaster, along a conveyor belt of sequential stages—may be why this model continues to inform the role of government in science,” he writes. Echoing Singh, Bonvillian argues that the United States needs an empowered bureaucracy to effectively steer federal investments in research and development to achieve the country’s climate ambitions while reinvigorating American manufacturing.

And the linear model is not the only simplified idea we’ve inherited about innovation, argues Shobita Parthasarathy. We’ve also nurtured a belief that innovation and markets alone can—and will—heal society’s ills. “For generations, scientists, engineers, and policymakers have assumed that the US approach to innovation would inevitably produce equity. But it has become clear that this is not the case,” she writes. Parthasarathy argues that systemic change is required, as well as a reconception of innovation itself. “For the last 75 years, the ‘endless frontiers’ of science have been defined too narrowly, by too few people, and with incorrect assumptions about the relationship between innovation and societal benefit.”

You’ll find these and other perspectives in this issue, along with art and poetry. As part of an effort to make our work accessible to the broadest audience possible, we’ve recently began hosting conversations on our new podcast. Subscribe at <https://issues.org/podcast/> to hear *Issues* editors talk with scientists, artists, and policymakers about *The Ongoing Transformation* of science and society. And please join this larger conversation in 2022 as we host live discussions with experts, our Science Fiction/Real Policy book club, and lively exchanges on Twitter and LinkedIn. As Representative Eddie Bernice Johnson, chairwoman of the House Science Committee, writes in her Forum letter: “We lead only by being the best possible version of ourselves.”