

Information Infrastructure for Societal Grand Challenges

Good afternoon, everyone.

For the 20 years I was at the Mellon Foundation, I worked with my colleagues in what was then the Scholarly Communications Program—and with quite a few of you—to support the development of digital information infrastructure. This infrastructure was not an end in itself but a means to advance the socially important processes in humanities disciplines of building our collective knowledge of the world and each other. To help remind us of that larger objective, I would often paraphrase the famous slogan from the 1992 Clinton campaign: “It’s the scholarship, stupid.”

The scholarship that now interests me in my role as CNI Senior Scholar is not just knowledge-building in the humanities but also that required across disciplines to address societal grand challenges. The grand challenges that face us as a society today include climate change and a range of other, often closely related, issues such as food security, forced migration, and pandemics, each of which in turn exposes and amplifies still other problems, such as inequality and racism.

Among these various societal grand challenges, I have decided to focus my inquiries on climate change research. My reasons for this focus include the problem’s urgency and scope, which are clearly motivating the scholars I have interviewed so far, and which should therefore motivate those of us concerned with the information infrastructure they need to address the challenge. So let me say a few words about urgency and scope before I conclude with a few comments on infrastructure requirements.

One sign of urgency is the ominous new phrases that we have learned from climate science and now incorporate into everyday usage, such as “polar vortex” and “atmospheric rivers.” Another is the regularity of dismaying reports. The latest landed two weeks ago from the experts on the UN-sponsored Intergovernmental Panel on Climate Change. The chair of this panel warned, as many other experts have before him, that “we are walking when we should be sprinting” to slash greenhouse emissions and contain global warming.¹

A key factor making solutions so elusive is the scope, or wickedness, of the climate change challenge. Some friends have joked that residing in New England, I must be using “wicked” in the Bostonian sense meaning “very,” such as “it’s wicked cold” or “she’s wicked smart.” Instead, the term has a technical meaning formulated in the 1970’s in the context of complexity studies. Those who coined the term wrote that a problem is wicked when it is “‘vicious’ (like a circle) or ‘tricky’ (like a leprechaun).” Wicked problems are difficult to define. They lack clear measures of success, and they are rarely solved. “At best they are re-solved—over and over again.”²

Although resolving climate change is often compared to a moonshot because of the need for focused attention, the comparison is otherwise not an apt one. The goals of a moonshot are unambiguous with clear measures of success. Either NASA lands on the moon, or it does not. Not so with climate change because the components of possible solutions are lodged in complex physical, biochemical, political, legal, economic, psychological, cultural, and other systems that each follow their own dynamic, but are also open and interdependent and therefore subject to influence

from each other, which in turn can “wickedly,” like a leprechaun, change the nature and definition of the problem.

The scope of climate change as a “wicked” challenge in this sense means that it is intrinsically an interdisciplinary problem, requiring all hands on deck to resolve. The NSF and NIH are certainly right to encourage the scientists applying for their grants, especially in closely related fields, to aim for “transdisciplinarity,” which they regard as the pinnacle among the types of collaboration because it yields new conceptions and approaches that transcend those of the original STEM disciplines.³ Given this ambitious goal and the enormous resources at the disposal of NSF and NIH, it is tempting for the public to stop there and rely on the STEM fields as our potential savior.

STEM research is certainly crucial for addressing wicked human problems, like climate change. The atmospheric and oceanic models that predict the rate at which the planet’s temperature will rise are fundamental to our conceptions of the problem. However, the scientists in the climate change centers and institutes I have begun to explore clearly recognize that the effects of their research depend on their ability to extend the range of their interdisciplinary collaborations to embrace the practical experience of members of the public, including those with local and indigenous knowledge. They also welcome the contributions of researchers in political, economic, sociological, and psychological studies as well as those of specialists in the humanities, or what one of my colleagues has aptly called the “imaginary disciplines.” Contributions from philosophy, religious and literary studies, history, anthropology, and the arts help us generally to *imagine* alternative ways of being in relation to justice and the good life, our gods, our fictions, our pasts, other cultures, and our creativity. Without such *imaginaries* in climate change research, it will be difficult to accommodate to, much less to mitigate, the grim realities that that face the planet.

In the university centers and institutes devoted to the grand challenge of climate change, where there is this rich and interesting array of interdisciplinary collaborations, I am also finding an intense interest in and recognition of the need for a substantial campus information infrastructure. The expressed needs cluster across the disciplines in the areas you might expect: tools to facilitate collaboration, to master the massive and growing journal literature; to incorporate local and indigenous knowledge systems, to manage databases and harmonize them across fields and research interests; and to engage in data and text mining, modeling and simulations, mapping, and other visualizations.

The institutions that you represent have been reorganizing staff expertise and investing in tools and services in these areas for more than a decade. One of the effects of the growing faculty interest in grand challenges, and especially climate change research, appears to be increasing demand for these services. In addition, because of the interdisciplinarity, it also appears to be concentrating the demand into a shared need for common infrastructure across disciplines.

Are you all seeing this kind of rising and concentrated demand on your campuses? If so, what strategies are you pursuing—or considering—to scale your services and related infrastructure to meet this demand? Please let me hear from you. Catch me in the reception, join me at the table for breakfast, grab me at a break, or write me at this address.

Many thanks for your kind attention.

Donald Waters, April 3, 2023

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- ¹ Plumer, Brad, "Climate Change Is Speeding Toward Catastrophe. The Next Decade Is Crucial, U.N. Panel Says." *The New York Times*, March 20, 2023. <https://www.nytimes.com/2023/03/20/climate/global-warming-ipcc-earth.html>.
 - ² Rittel, Horst W. J., and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, no. 2 (1973): 160-163. <https://doi.org/10.1007/BF01405730>.
 - ³ Stokels, Daniel, Kara L. Hall, and Amanda L. Vogel, "Transdisciplinary Public Health: Research, Education, and Practice," in Haire-Joshu, Debra, *Transdisciplinary Public Health: Research, Education, and Practice*, Newark: John Wiley & Sons, 2013, p 5.