

striking, false-color graphics that showed the ever-widening “hole” in the ozone layer above Antarctica. First published in 1985 by the National Aeronautics and Space Administration’s Scientific Visualization Studio, these now-iconic artifacts succeeded in visualizing an otherwise invisible atmospheric process, bringing a looming environmental crisis to the world’s attention. Response to those images was swift and decisive, and only two years after their publication, effective legislation was in place.

Atmospheric warming is, of course, a different process than ozone depletion, with different environmental and economic implications, but it is just as invisible. Yet so far, no equivalent to an ozone hole visualization has been found for global warming. We are stuck with polar bears and melting ice caps, aging poster children who have lost any impact they may once have had. “I had long assumed the solution to global warming was, basically, clearer communication,” writes Revkin, who goes on to list some of the failed climate metaphors that he has put to rhetorical work over the years, including “carbon dioxide added to the atmosphere is like water flowing into a tub faster than the drain can remove it,” or “the greenhouse effect is building like unpaid credit card debt.” To write about climate change is to be in the metaphor business, but so far—with the possible exception of the Keeling curve, with its dramatically rising, saw-toothed blade—no clinching image has been found. But then how do you visualize something that has become too big to see?

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As someone who has greatly admired Andrew Revkin’s work over the years, I very much enjoyed reading his story about his life’s journey in the world of journalism and science communication. However, I took issue with one of the claims he makes about science.

Revkin claims, as if it were self-

evident, that a major hurdle in our response to climate change is that “science doesn’t tell you what to do.” He then invokes the “is-ought” problem coined by the eighteenth century philosopher David Hume, which states that no description about the way the world is (facts) can tell us what we ought to do (values). I would argue, however, that this separation between facts and values is a myth. Values are reducible to specific kinds of facts: facts related to the experience and well-being of conscious creatures. There are, in fact, scientific truths to be known about human values (a view defended most notably by the philosopher and neuroscientist Sam Harris in his book, *The Moral Landscape: How Science Can Determine Human Values*).

I agree with Revkin that environmental, economic, and cultural forces influence the values adopted by individuals and societies, but the reason is because they change our brains and influence our experience of the world. These changes can be understood in the context of psychology, neuroscience, and other domains related to the science of the mind. Human well-being is ultimately related, at some level, to the human brain.

Similarly, the reason climate change is so worrying to us is because of the consequences that it will ultimately have on our well-being. Whether we realize it or not, our concerns for the environment are ultimately reducible to the impact it has on the conscious creatures in it (both human and non-human).

Revkin is by no means alone on this. Most people, scientists included, seem to agree not only that ethics is a domain that lies outside the purview of science, but that it is taboo to even suggest otherwise. But perpetuating this myth has consequences. Our failure to recognize the relationship between facts and values will have wider implications for public policy related to many rapidly emerging technologies and systems, from artificial intelligence to agricultural technology to stem cell research to driverless cars.

It’s important to note that in this context, “science” isn’t merely synony-

mous with data, models, and experiments; these are merely its tools. We must recognize that science is actually more comprehensive than this. The boundaries between science, philosophy, and the rest of rational thought cannot be easily distinguished. When considered in this way, it’s clear that science can answer moral questions, at least in principle. And, as Sam Harris puts it, “Just admitting this will change the way we talk about morality, and will change our expectations of human cooperation in the future.”

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## Reviving nuclear power

In “A Roadmap for U.S. Nuclear Energy Innovation” (*Issues*, Winter 2016), Richard K. Lester outlines in a thought-provoking manner the significant obstacles to and absolute necessity of innovation in the nuclear industry in the United States, and he provides well-founded recommendations for how the federal government can be more supportive of nuclear innovation. That being said, we need to think more creatively about policies to support nuclear energy, based on the federal and state policies that are currently leading to a boom in both natural gas and renewable energy across the nation.

Natural gas has benefited from 30 years of federal support, not just through research and development, but through public-private partnerships and a 20-year production tax credit for unconventional gas exploration and hydraulic fracturing in shale. These investments have made shale gas so cheap today that it is disrupting the energy market, producing more electricity than coal for the first time ever. Similarly, a suite of federal and state policies have been implemented to both drive down the cost of renewable energy and incentivize deployment.

Federal support for nuclear energy could level the playing field and help expand all clean energy options as the