ZACH GRAVES AND ROBERT COOK-DEEGAN

Incorporating *Ethics* Into Technology Assessment

Despite concerns about a slowdown in technological innovation—as expressed recently by the entrepreneur Peter Thiel, the economist Tyler Cowen, and others—humankind is poised to make transformational scientific and technological strides in the coming years. Driverless cars are being tested in major American cities. SpaceX is building a low-cost space-based internet service. Artificial intelligence, though falling short of the general humanlike intelligence of science fiction, is becoming useful in addressing complex tasks, including diagnosing cancer and live translation. Some innovations are also bringing intense controversy, such as the twin babies born in China who had their genes edited to make them (and their offspring) resistant to HIV. The researcher, He Jiankui, did so using a technique only discovered in 2012. Technology may not be advancing as quickly as it could be, but it is still advancing rapidly, and not just in the digital sphere.

Although technological innovation can bring enormous benefits in material well-being, new technologies can also create social and economic disruptions, national security risks, and ethical dilemmas—all of which raise complex questions that democratically elected representatives must be prepared to consider soberly. For instance, advances in gene editing may lead to the amelioration of debilitating diseases, but also to the possibility of designer babies, do-it-yourself biohacking, and new forms of bioterrorism.

The conventional wisdom is that law and policy lag behind advances in new technology—a gap that has only widened in recent years. If the mantra of Silicon Valley is "move fast and break things," Congress's might well be "move slowly and ignore things." Congressional inaction has created some messy situations, particularly where there is a lack of clarity about the scope of agency authority, or when states move to fill a gap left at the federal level. Federal inaction has stalled policy debates over issues such as autonomous vehicles, digital privacy, and cybersecurity, to name a few. The result is uncertainty that unnecessarily delays the benefits of new innovations, undermines America's global competitiveness, and obscures consideration of how legitimate harms and ethical questions can be addressed.

A key challenge in the coming years will be: How can the nation better equip policy-makers to understand the implications of new innovations? Beyond the technical details, how can we improve the way in which they understand the value choices and trade-offs of different policy approaches?

Congress's lobotomy

Congress is known for its dysfunction. Matters have gotten only worse in the past few decades, as congressional resources have shifted away from policy expertise toward constituent services and political messaging. This trend is driven by factors such as lower barriers to digital communications, a faster-paced media cycle, and a greater concentration of power in congressional leadership compared with committees and individual members.

Beyond shifting priorities, Congress's institutional capacity has declined in absolute terms. Since the invention of the World Wide Web in 1989, congressional committee staffing has shrunk by 38%, and staffing at legislative support agencies has shrunk by 40%. These cuts included the defunding in 1995 of the Office of Technology Assessment (OTA), which served as a think tank within Congress on scientific and technical issues. Across the institution, staff are overworked and underpaid relative to their peers in the executive branch.

This decline has been driven by the politics of the 1994 Republican Revolution, whose Contract with America platform promised to slash spending in Congress. After this self-performed lobotomy, it's no great surprise that elected

representatives are struggling to understand how Facebook makes money, what "the blockchain" is, or similar matters requiring basic technical literacy. At a recent committee hearing on quantum computing, a congressman told the expert panel, "I can understand about 50 percent of the things you say." At another recent hearing on 5G, the emerging fifth-generation cellular network technology, Senate Judiciary Committee chairman Lindsey Graham (R-SC) touted the dubious security benefits of his flip phone. At the same hearing, the ranking member Dianne Feinstein (D-CA) admitted that the subject—despite being worth an estimated $12 trillion in global economic output—is something "I know very little about."

Though Congress has done a lot to earn its reputation for lacking knowledge and sophistication about technology, this stereotype is not universally true. There are dozens of scientists and technical experts serving on Capitol Hill through fellowships such as those offered by TechCongress and the American Association for the Advancement of Science. Many committee staff come from technical backgrounds, and the legislative support agencies such as the Government Accountability Office (GAO) and the Congressional Research Service (CRS) employ staff with scientific and technological training. Nonetheless, the current resources on the Hill are far short of where they need to be to meet twenty-first century policy challenges.

Congress has finally started to recognize its own deficiency in science and technology (S&T) expertise. As Senator Ron Johnson (R-WI) put it, "Most of us are Gilligan. There aren't a whole lot of Professors." Following high-profile gaffes at hearings with the likes of Facebook's Mark Zuckerberg and Google's Sundar Pichai over the past two years, this realization has started to transform into concrete action.

GAO announced in January 2019 the creation of a new Science, Technology Assessment, and Analytics team, and promised a rapid ramp-up of staffing to meet congressional needs. The House of Representatives approved $6 million to revive the long-dormant OTA. That effort may or may not survive House-Senate appropriations negotiations for Fiscal Year 2020, but it is an important signal that Congress is starting to take S&T policy more seriously. This interest is bipartisan, with endorsements to revive OTA (or fund an OTA-like entity) from Senator Thom Tillis (R-NC), House Speaker Nancy Pelosi (D-CA), House Minority Leader Steny Hoyer (D-NY), and a unanimous bipartisan recommendation from the House Select Committee on the Modernization of Congress. Democratic presidential candidate Andrew Yang has even made reviving OTA part of his platform.

Improving Congress's capacity for S&T policy analysis promises to infuse national policy decisions with more and better information, so the recent efforts are all welcome. But it is worth reflecting on the limitations of these improvements in policy analysis. Equipping policy-makers with better information and analysis can help them devise wiser policies—policies that make it possible for society to enjoy (and accelerate) the fruits of innovation while mitigating some of the problems it can raise. It would be a mistake, however, to think that economic information, statistics, and scientific data are all that matter in informing policy decisions.

Purely technical analysis—technology assessment in its narrow sense—is necessary but not sufficient. Congress needs to pass laws, exercise oversight, and fund government activities in real time and in the face of considerable uncertainty. The decisions are too broad and too important to be left to scientists, economists, and technical experts alone.

Policy deliberations are driven by competing values and incentives. These can take the form of considering economic benefits accruing to one district over another in an infrastructure bill, weighing trade-offs between privacy and security in a surveillance bill, or balancing risk tolerance in a nuclear waste disposal bill. Before competing value preferences can be hashed out, there must be clarity about the full implications of different policy approaches.

When values trump facts

Can balanced and disinterested S&T policy assessment flourish in the current political climate? Our hypothesis, to be tested in practice, is that the answer can be yes. But that "yes" depends on science policy and technology assessment not only explicitly addressing the evidence and technical prospects but also confronting the nontechnical values at stake, and using outreach and public engagement methods that were only beginning to take root when OTA was defunded in 1995.

Directly addressing issues arising in science and technology by looking beyond the technical aspects is not a departure from precedent. The National Academies, a host of executive-branch bioethics commissions, and the congressional research units (GAO and CRS, and before that, OTA) have all, to some degree, incorporated ethical analysis, history, and outreach into their work. Philosophers and bioethicists chaired OTA advisory committees that dealt with commercial biotechnology, human gene therapy, Alzheimer's disease, the Human Genome Project, and DNA patenting. Many OTA and National Academies reports devote sections to the analysis of social impact and ethical issues accompanying new technologies. One of OTA's more remarkable reports, *Infertility: Medical and Social Choices*, was quite explicit about addressing social and not just medical aspects of reproductive technologies, and did so in clear, no-nonsense prose. That report's advisory committee was also chaired by a philosopher and bioethicist, and included three other scholars in bioethics. The National Academies produced

Society's Choices, *Biomedical Politics*, and other volumes that included explicit ethical analysis alongside technology assessment and social impact foresight.

Though the scientific and medical communities do not always welcome such analysis, moral constraints and prudence have long trumped scientific autonomy. The first national bioethics commission was established in the late 1970s, in the wake of the public scandal surrounding the Tuskegee syphilis study. It fueled the movement toward systematic external review of experiments involving human participants and bolstered rules for ensuring risk-benefit assessment and informed consent. It has long been clear that if human rights are endangered, moral principles ought to override scientific autonomy. Broad concerns about biological technologies were addressed by all the subsequent bioethics commissions: one that began under President Carter and finished under President Reagan, another short-lived commission under President George H. W. Bush, President Clinton's Advisory Committee for Human Radiation Experiments and his National Bioethics Advisory Commission, President George W. Bush's Council on Bioethics, and President Obama's Presidential Commission for the Study of Bioethical Issues. But these commissions were largely centered on ethical analysis of public issues that were already near at hand, whereas what we are emphasizing is the need to incorporate ethical, historical, and social analysis into policy analysis about science and emerging technologies.

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In the early 1980s, when University of California, Los Angeles, geneticist Martin Cline's premature experiments introducing recombinant DNA into patients became public and produced an outcry, the nation's second bioethics commission, under President Reagan, produced the report *Splicing Life*, which pointed out the absence of a regulatory framework. The report explicitly acknowledged the value choices at stake. The Office of Technology Assessment was then asked to review the role of agencies and progress of science. The House held hearings and the National Institutes of Health (NIH) and the Food and Drug Administration (FDA) developed "points to consider" in developing evidence about the safety and efficacy of potential gene therapies under Congress's watchful eye. By 1999, when 18-year-old Jesse Gelsinger died in a gene therapy trial, there was no OTA, and policy careened between NIH and FDA. Congress had no expertise or focus. In subsequent years, only a handful of government bodies looked into gene therapies, and policy discussions never proceeded far.

Now, two decades after Gelsinger's death, new techniques for modifying the human genome, especially the CRISPR/Cas9 gene-editing technology, make the need for wise oversight even more urgent. The National Academies, the World Health Organization, and other bodies are doing their part—producing reports, developing guidelines, and convening meetings—but if the United States is to have any meaningful oversight of these powerful new technologies, Congress will ultimately have to be involved. Yet given its weak analytical capacity, Congress will be flying blind, informed by technical bodies but lacking its own capacity to conduct the kind of policy-savvy, politically aware analysis that explicitly clarifies value choices around questions such as: When is it safe to begin? Does it even make sense, given alternatives? How will society know? Who should decide? What should be the role of the United States in the international context? What are the different agencies already doing (and not doing)? What will it mean in the long run?

In the political realm, emphasizing the consideration of ethical issues may help build a broader base of support among conservatives for getting a new congressional technology assessment office off the ground. Social conservatives have long been concerned about bioethics, including such issues as stem cell research, end-of-life care, assisted reproductive technology, human participation in medical research, human cloning, and the emerging frontiers of biological science. And policy-makers of all political persuasions are increasingly interested in the ethical implications of science and technology beyond biotech—including the ethics of artificial intelligence and algorithmic bias, addiction and disinformation on social media, and the ways facial recognition and other new tools will affect privacy and law enforcement.

Conflict avoidance

As Congress considers revitalizing and perhaps restructuring OTA, and as GAO's science policy team expands, it is worth considering the ways that building ethical analysis into technology assessment entails risks and may invite criticism. First, it may bring political controversy that could alienate stakeholders in Congress—stakeholders who may be necessary for getting continued funding. Second, it could create methodological conflicts between empirical analysis and more subjective normative analysis. Third, it could be perceived as promoting (or, in fact, promote) overly precautionary thinking.

We believe these issues can be mitigated through careful methodological construction, reflecting the spirit of the original OTA. The role of OTA wasn't to tell policy-makers what bill to vote for, or even how to write a bill. Rather, it was to help inform them about the social, economic, and technical implications of policy choices. This left determinations about resolving values conflicts appropriately to policy-makers themselves.

For instance, law enforcement agencies have argued that tech companies such as Apple and Google should be compelled to create a backdoor to electronic communications. To help inform this debate, a new OTA would provide a common baseline of facts about the trade-offs of different policies. This information might cover vulnerabilities that different cyber-backdoors create, how they might affect iPhone or Android sales abroad, and how they would affect users' privacy. But ultimately the elected representatives would have to weigh these trade-offs against potential reductions in domestic terrorism or other crimes. The role of policy analysis is to help legislators see the values at stake more clearly, thus enabling them to produce policies that are more evidence-based and less intuitive.

Similarly, the incorporation of ethical analysis into technology assessment should focus on clarification of what's at stake, rather than an endorsement of one policy approach or another. Thus, "ethics assessment" should strive to provide information about arguments on different sides and put them in perspective. Fairly presenting different sides of an ethical dilemma, while providing ample opportunities for stakeholder participation, will limit blowback on the analysts. Technology assessment that addresses ethical questions can be used to separate real ethical issues from hyperbolic fears, and highlight how different values trade off against each other (e.g., how privacy trades off against security). In the context of broader policy analysis, ethics assessment can also help throw water on reactive policy proposals by grounding them in economic and technical terms.

Premature fears about new and emerging technologies can muddle the conversation and make it difficult to see the full picture. For instance, though a great deal of ink has been spilled talking about Facebook's Cambridge Analytica privacy scandal (which has been overblown in some important ways), relatively little attention has been given to how the platform was exploited by state-backed disinformation efforts to promote ethnic cleansing in Myanmar, or undermine pro-democracy protests in Hong Kong. Though privacy is an important consideration, it is not usually the only issue at stake or necessarily the most important. A broadly focused technology assessment unit could help policy-makers see the bigger picture and understand what issues are at stake beyond salient stories in the news.

Rather than just being a vehicle to slow down innovation, ethical arguments can also be used to promote a "permissionless innovation" agenda. Though it's easy to see harms caused by drugs that are approved too hastily, for example, policy-makers have little insight into the harms caused by delaying or disincentivizing the development of beneficial drugs, or the extremely complex economic incentives that drive biomedical innovation. Nor do they have the tools for addressing the trade-offs between incentives for innovation and access to the services and products that result. Likewise, the testing of highly automated vehicles is likely to result in numerous accidents involving machine error (sometimes making mistakes that humans wouldn't). Although policy-makers may face pressure to end testing after a high-profile accident, zero risk isn't a realistic expectation. Rather, a particular technology must be compared against human error rates, while also bearing in mind the technology's potential to dramatically reduce the 37,000 annual motor vehicle-related fatalities in the United States (and 1.25 million globally) over the long run. These kinds of ethical insights can help push back against the overly risk-averse posture often adopted by federal agencies.

Conversely, since Silicon Valley doesn't seem to consider ethics when bringing a product to market or rolling out a new feature, it's necessary for policy-makers to anticipate secondary effects of new technologies. Ethical issues will be an important part of policy debates whether or not they're covered by GAO's new Science, Technology Assessment, and Analytics team or a revived OTA. It should be preferable to build this informational capacity within Congress, rather than leave it to popular media or activists (who often do not grasp the technical or policy nuances) to define these problems and design their solutions.

Both parties have a stake in ensuring that Congress can assess both the technical issues and the value choices that accompany emerging technologies. Republicans and Democrats may not agree about the federal role in managing gene patents, or stem cells, or self-driving vehicles, but they can agree that sound technical assessment and explicit framing of the value choices can bound the debate and clarify the choices. And though these days any expectation of bipartisanship might seem naive, it does seem possible that at least some policy debates around emerging technologies might find common ground, and would not have to break along partisan divides.

A new congressional technology assessment office will be better served by deliberately preparing to tackle ethical challenges, rather than pretending that policy choices can be reduced to technical factors and empirical analysis, or addressing ethical implications only as an afterthought. Explicit attention to ethical analysis can minimize the potential risks, clarify policy choices, and provide policy-makers with a fuller understanding of the issues at stake in debates over emerging technologies.

Zach Graves *is the head of policy at Lincoln Network and a visiting fellow at the National Security Institute at George Mason University's Antonin Scalia Law School.* ***Robert Cook-Deegan*** *is a professor in the School for the Future of Innovation in Society and the Consortium for Science, Policy & Outcomes at Arizona State University.*