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# FBI, AAAS Collaborate on Ambitious Outreach to Biotech Researchers and DIY Biologists

A few years ago, while working on the Personal Genome Project at Harvard Medical School, Jason Bobe began to see a new outline for the future of biotech: The technologies were quickly getting more and more powerful, and less and less costly. It was only a matter of time before almost anyone with an interest could have DNA sequencing equipment in their own homes.

And so Bobe and his friend Mackenzie Cowell founded DIYbio, a group of amateur biologists with a strong science-power-to-the-people ethos. For the founders it was part-time thing, evenings and weekends, but it didn't take long to generate a reaction. In addition to the many people interested in joining the group, there were newspaper stories that seemed to suggest the DIY crowd would be brewing rabies and anthrax in their bathtubs.

It was about that time that the FBI expressed an interest, too.

"What does it mean for the FBI to come calling? I felt a little friction," Cowell says now. "Initially, nobody was sure what was going to happen. But we're not doing anything bad, and we all believe in the safety and value of what we're doing.... So it's little weird, but it's ok to say to the FBI, 'Ok, we can talk to you.'"

But the interaction defied every stereotype. What Bobe, Cowell and their colleagues found was that the FBI wasn't out to crack down or conduct surveillance—this wasn't the sort of hard-charging G-man operation suggested by decades of popular lore. Instead, Bobe made a presentation at the first synthetic biology conference sponsored by the FBI, "Building Bridges Around Building Genomes." The conference was attended by FBI officials, industry and academic representatives, policymakers, and leaders in the emerging amateur biology community.

The event, held in San Francisco in August 2009, was organized in collaboration with AAAS, the U.S. Department of Health and Human Services, and the Department of State. It served as the springboard for an ambitious outreach effort aimed at professional researchers and community biology groups—and as the foundation for a partnership between the FBI, AAAS, and other scientific associations and groups.

At a series of conferences and less formal meetings since that first event, the organizers have made presentations and listened to scientists discuss their work and their concerns. The goal has remained constant: to build common cause on efforts to support research while raising awareness of security issues.

"We want the science and security communities to come to an understanding to promote a culture of responsibility," says Edward H. You, an experienced researcher and now the FBI supervisory special agent guiding the outreach effort. By bringing those communities together, "we can... identify what some of the risks and gaps might be, and then come up with strategies that make sense to both communities to mitigate those risks and gaps."

The latest chapter in the partnership is scheduled for next week, when You and AAAS biosecurity expert Kavita Berger, an associate program director in the Center for Science, Technology and Security Policy, appear at a meeting in La Jolla, California, organized by the [Massachusetts Society for Medical Research](#) (MSMR) on regulation, compliance, and biosecurity challenges facing research institutions.

### Biotech: Balancing Promise and Risk

Just a few decades ago, the idea that humans could create artificial life was mostly the province of science fiction. Now, however, the question seems less a matter of *if* than *when*. In [research published](#) last May in *Science*, genomics pioneer J. Craig Venter announced development of the first cell controlled by a synthetic genome. That may fall short of creating life, but the breakthrough underscored that biotech will likely create unpredictable implications for science and society.

In basic terms, biotechnology explores and manipulates the building

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The DIYbio poster

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blocks of life. Drawing from the fields of biology, chemistry, engineering, computer modeling, nanotechnology, and the emerging field of synthetic genomics, researchers are able to stitch together pieces of synthetic DNA—without the use of existing genetic material—to generate the genomes of small microbes.

Biotech has already made great strides, and it holds enormous promise in medical care, food production, environmental clean-ups, and creating new sources of energy.

Within the past decade, researchers also have used the technology to re-create infectious viruses such as polio, the virus implicated in the 1918 global flu pandemic, and SARS.

By its nature, biotech contains a degree of risk, and risk gives rise to uneasiness. Early in the biotech age, there's a defining question: How will society balance the promise and the risks?

It wasn't a new question. It had come up much earlier—in the 1970s, as the field of recombinant DNA was developing. But the question came to a head after the terror attacks of 11 September 2001 and the anthrax-by-mail attacks soon after that left five people dead and 17 others infected. In response, policymakers and law enforcement intensified their focus on biotech and its potential capacity to support bioterrorism.

The response was understandable, but many scholars—especially some who were helping the FBI as anthrax experts—objected when they were visited by federal agents and treated with what seemed to them like suspicion.



Kavita Berger

The effect was evident in a poll of researchers a few years ago conducted by a team that included Berger.

Only about a third of the researchers polled were comfortable sharing their work details with federal agents. Only 14% expressed comfort with the FBI in a role of monitoring their research. Only 11% thought it appropriate for the FBI to evaluate whether research might have alternative applications that could pose a security risk. Only 6% thought it appropriate for federal agents to ask them about a foreign colleague, and even fewer if that colleague was an American.

"In the life sciences, researchers and security officials hadn't had much history of working together," says Gerald Epstein, director of the AAAS Center for Science, Technology and Security Policy. "After 9/11, tensions threatened to grow between them. Neither group understood how the other operated, and each thought the other was basically clueless."

In Berger's view, the risk was tangible: If scientists and agents couldn't build a working relationship, then policy-makers, acting out of mistrust or fear, might impose rules that could impede research without really improving security. Collaboration, she concluded, is "ultimately going to be a lot more productive and a lot more useful in reaching the end goals of security and science."

### Biotech: Balancing Promise and Risk

In 2008, Berger invited the FBI's Bioterrorism Prevention Team at the [Weapons of Mass Destruction Directorate](#) to make a presentation at a meeting on global health security. Soon after, the FBI asked AAAS to help with a meeting on biotechnology. It was about that time that Berger met Ed You, who had come on board as the supervisory special agent for the Bioterrorism Prevention Team.

You has a strong background in science: Before joining the FBI, he had earned a master's degree in biochemistry and molecular biology and had worked in gene therapy and cancer research. In the ensuing months, the FBI and AAAS forged a partnership, often including FBI field offices, other science associations and scholars, and top administrators and safety officials at universities and research centers.

Next week's MSMR meeting in La Jolla will be the latest of more than a half-dozen meetings in different parts of the United States, all generally focused on how to align the interests of research and security without compromising either of them.

At some meetings they've had WMD coordinators from the FBI and researchers work through simulated problems related to biotech and biosecurity. In the process, they learned about each other's values, perspectives, and practices; most importantly, You says, they were able to establish relationships to ensure that the dialogue continued after the meeting.

Claudia Mickelson, deputy director of the MIT Environmental Health & Safety Office, had been working with the FBI on security issues before AAAS and the FBI joined forces; she has since helped organize MSMR meetings that bring both organizations together with leaders at research institutions. The partnership, she said, has allowed a significant increase in the scale of interaction between researchers and law enforcement.

"As with any group of people, it's an unusual experience [for a scientist] to have contact with the FBI," Mickelson said in a recent interview. "The outreach effort has advanced from a point where there was no knowledge to a point where they can now put a real face to the FBI and understand the concerns of the FBI. And they can express the concerns of the research community."



DIYbio co-founder Mackenzie Cowell (seated) and FBI Supervisory Special Agent Edward H. You talked during a meeting last fall at AAAS.

"This has removed a lot of the worry—that's the biggest effect. Every time the FBI reaches out to anyone in the research community, everybody learns."

You agreed that the partnership has helped to create new understanding. "I think the FBI and AAAS partnership is valuable," he said in a recent interview. "Our end goals are the same. The difference is that we utilize AAAS to act as a sounding board to make sure that our security message is relevant and understandable to the scientific community. And then, by going in together, we have that much more impact."

Adds Berger: "It really comes down to building relationships among these groups and breaking down the mistrust that grew up in the time after 9/11. We're trying to work with research institutions so that, if an incident does arise, there's a structure in place where everyone can deal with it constructively."

### DIY Biology: "It's a Zeitgeist"

If professional scientists had unease about the FBI, early attitudes among the do-it-yourself biologists may have been doubly fraught.

The community now numbers several thousand people all over the world, a diverse group ranging from professional researchers to artists and writers, and from hobbyists to high school students contemplating a career in science. But to varying degrees, DIY groups have taken on hues of counterculture. Some adherents refer to themselves as "biohackers" and "biopunks." [A poster](#) for DIYbio, the group founded by Bobe and Cowell, features an iconic fist holding a pipette, but it immediately conjures impressions of a 1960s street protest.

Bobe, for the record, cringes at the term "biopunks." And Cowell says there's no threat posed by the DIY culture. The news media are focused on community biology groups because they sit "at the intersection of sexy and scary," he says. They and other leaders in the amateur biology organizations say that home labs are far short of the capabilities required to create the tools of bio-terror.

Instead, they see parallels to the rise of computing culture in the 1980s. Just as the "hacker ethic" in early years focused on free information and improvement in the quality of life, and just as early computer geeks helped drive the evolution of technology and culture, they see DIY biology groups as a democratizing force that can interact with mainstream science and have broad influence in the years ahead.

Even in the near term, they see their community as a forum for engaging people—especially young people—with science.

Some people drawn to DIYbio are exploring serious topics such as alternative energy or cures for malaria. Others have "questions about the world around them that may not be interesting to a scientist seeking tenure," Bobe says. "What bacteria live in the mouths of my pets? What strain of tomatoes do I have in my garden? [What is actually in kombucha?](#)"

"It's a zeitgeist," Cowell says. "There's a public interest in biotechnology—it's a trend for the 21st century, and they want to understand it and experience it and build intuition about it."

Ellen Jorgensen, an adjunct assistant professor of pathology at New York Medical College and president of the [Genspace](#) community lab in New York City, notes that only about half of Americans trust genetically modified foods, and only a third believe in evolution. That, she says, shows a potentially valuable communications role for community biology groups.

At art fairs and public presentations, the community biology groups have demonstrated how DNA can be extracted from a strawberry using household materials. In one exhibit described by Cowell, human DNA was extracted from human saliva using soap, salt, and 160-proof rum. (But when the test subjects are invited to drink the solution, he said, some responded: "Oh my God, no—it has DNA in it!")

Law enforcement, understandably, has been curious about the activities of amateur biologists. But the interactions have created some significant tensions.

In 2004, there was a flashpoint: An upstate New York artist and art professor was working at his home on an exhibit that involved bacteria. One morning he awoke to find that his wife had died in her sleep, and he called 911. When paramedics arrived, they were alarmed at what they found: lab equipment, books on biowarfare, bacteria cultures. Soon the house was surrounded by agents in hazmat suits. The artist was arrested.

Even after the bacteria and his project were proven harmless, he spent years resolving legal problems. While the local response might seem natural, many in the DIY biology community saw a troubling message: Science could become walled off from public involvement—at a cost to not only to artistic expression, but to the pursuit of discovery and to innovation.

Berger and You acknowledge the concerns of local officials, but they also respect the right of amateur groups to explore the realms of science. And that's been the basis of the FBI/AAAS outreach to community groups.

"We've started building these bridges and we have a real commitment to understanding this community, and a real appreciation," You says. "The reason that the FBI is reaching out to DIY biology groups is not because there's a threat... but because we want to make sure it's done safely and securely."

Jorgensen recalls encountering the FBI for the first time in November 2009, during the [International Genetically Engineered Machine](#) competition—the prestigious iGEM event that draws some of the world's most creative young synthetic biology scientists and engineers. The FBI co-sponsored the event; agents made a presentation on synthetic biology and attended other events. But Jorgensen had heard of the New York



Vice President Daniel Grushkin and President Ellen Jorgensen of the Genspace community laboratory in New York City visited AAAS last fall.

artist's case, and "at first I was very wary," she recalls. "But I was impressed with Ed You and his willingness to reach out to DIYbio."

Her orientation was shifting. "If we were to thrive in post-9/11 New York," she realized, "we had better be proactive in reaching out to the FBI." She introduced herself to the FBI's Boston field office WMD coordinator, and through him arranged an introduction to Pat O'Brien, the FBI's WMD coordinator in New York City.

Soon the FBI, New York City police, DIYbio, and a bio-artist group from Columbia University all came together at a workshop. There have been other meetings since, including one last fall at AAAS that featured a range of representatives from community biology organizations, government, science, and the FBI.

To Cowell, building a bond with the FBI feels counterintuitive, but he sees its importance. Being transparent is essential if the DIY biology movement is to grow and be trusted by surrounding communities. Now the FBI WMD coordinator from Boston regularly attends DIYbio meetings there.

"He's pretty cool," Cowell says. "I think it's a good thing that he's part of the community—there's a shadow of it feeling sinister, but for the most part it's cool.... If we're going to walk the walk, we have to be able to talk to the FBI."

### **A Paradigm Shift Among Researchers**

The positive reaction isn't uniform in the DIY community, or among professional scientists at research universities. But You, Berger, and others say that the outreach, in the space of a couple of years, has had a dramatic calming effect on all sides.

"We're seeing more and more people from research institutions wanting to have this conversation at their institutions," says Berger. "The more people are aware of what's being said and done, the more they want to get involved in it—not only at their institutions, but at the national and state level of the discussion."

You puts it succinctly: "We're seeing a real... paradigm shift."

Community biology groups, too, are buying in to the culture of responsibility. DIYbio still has the protest-style poster, and its leaders remain strongly committed to the democratization of science. But they're working now to develop norms of practice, safety standards, and ethical standards, and they're engaged with the FBI, AAAS, and others to guide them in those areas.

DIYbio and the Synthetic Biology Project at the Woodrow Wilson International Center for Scholars have teamed in a [project](#), funded by the Alfred P. Sloan Foundation, to promote codes of conduct and safety in the amateur biology community. DIYbio is planning a "[continental congress](#)" that will convene delegates for a series of meetings in the United States and Europe to write a draft code of ethics.

"With all of the outreach, we have come to a happy spot now," says Bobe. "We're through the journalism storm of people being freaked out about amateurs and WMD. We're now in a much more constructive stage where we're educating each other more."

And when Genspace opened its community lab last December in a former bank building in Brooklyn, a top agent from the FBI's New York WMD office was at the opening reception to congratulate the group and help members to celebrate. The 500-square-foot office and lab is equipped and operates to meet federal Biosafety Level 1 standards.

"I think that the meetings we have had were very useful in terms of fostering some trust between the FBI and the DIYbio community," says Jorgensen.

"We are all arriving at the same place, it seems, dragged kicking and screaming into more organization than we thought we'd be comfortable with in the beginning. But if a system of safety standards, operating procedures, advisory committees, and training records for lab members will allow us to get on to the good stuff and do science instead of just talking about it, it's a small price to pay."

Edward W. Lempinen

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