

*Devoted to noteworthy happenings
at the medical school*

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WHITE HOUSE AT OUR HOUSE

On the chilly October morning of the White House Frontiers Conference, innovators from across the country gathered at the University of Pittsburgh and Carnegie Mellon University to discuss frontiers in science and technology—from driverless cars to precision medicine to missions to Mars. For presenter Michael Boninger, the ultimate frontier is very close to home.

“The next moonshot is the brain,” he said. Boninger, professor of physical medicine and rehabilitation and a UPMC vice president, spoke on the promise of pairing artificial intelligence with assistive technology to help people with disabilities. He showed videos of the few patient volunteers who’d undergone a surgical procedure to connect to a Pitt-developed technology that uses a brain-computer interface, or BCI. (The technology is based on studies by Pitt’s Andrew Schwartz, Distinguished Professor of Neurobiology.) One video showed a young father, paralyzed from the neck down, grasping his girlfriend’s hand for the first time in years.

“This person could reach out and touch a person’s hand. But he couldn’t feel it.” That, Boninger said, became the Pitt team’s next frontier.

Recently, Pitt and University of Chicago researchers collaborated to implant BCI electrodes not only in the motor cortex, but also in the sensory cortex. Nathan Copeland, a 28-year-old with tetraplegia, became the first person ever to experience the sensation of touch using a brain-controlled prosthetic limb. The afternoon of the Frontiers Conference, in Pitt’s Alumni Hall, President Barack Obama met Copeland. The president would later recall their meeting in his plenary remarks: “We shook hands. He had a strong grip, but he had kind of toned it down. Then we gave each other a fist bump.

“That’s what science does. That’s what American innovation can do ... that’s what this Frontiers Conference is all about—pushing the bounds of what is possible.” —*Elaine Vitone*

VOICES FROM FRONTIERS

“Patient input is the blockbuster drug going forward.”

—Margaret Anderson,
Executive Director, FasterCures

“Some of the most important things we’re doing are derived from the difficult questions that patients have asked me about their own health.”

—David Okonkwo,
Pitt Professor of
Neurological Surgery

“Anybody who said we couldn’t do it wasn’t invited back.”

—Elizabeth Tyler-Kabara,
Pitt Associate Professor
of Neurological Surgery
(re: the effort to restore touch with brain interfaces; see photos and story to right)



Obama fist-bumps Copeland as Pitt’s Jennifer Collinger stands by.



PHOTOS: UNIVERSITY OF PITTSBURGH



Overheard: President Barack Obama

“In summer 2005, I was a 16-year-old intern for Congresswoman Barbara Lee, trying to find my way around the Capitol. In my rush to get on an elevator, I almost knocked over the person inside. I looked up to apologize and recognized then-Senator Barack Obama, whose iconic speech at the Democratic National Convention had made him my ultimate role model,” said Alexis Chidi, Pitt-Carnegie Mellon MD/PhD student, as she introduced the president of the United States to White House Frontiers Conference attendees in Pittsburgh this October. Since that first encounter with Obama, Chidi has finished her PhD as part of the Pitt Medical Scientist Training Program. She will graduate with her MD in 2017.

Obama noted that Chidi neglected to mention that “she started on her premed degree when she was 16.” He then added, for the faculty members present, “I hope you already have tenure, because Alexis is coming!”

The president joked that his conference hosts are both with the “Obama alumni mafia”: Carnegie Mellon’s President Subra Suresh served as director of the National Science Foundation under Obama, and Pitt’s Chancellor Patrick Gallagher directed the National Institute of Standards and Technology (and now serves on a commission exploring issues of cybersecurity for Obama’s administration).

What follows are select remarks from the president during a Pittsburgh panel on brain science and medical information, which was moderated by Atul Gawande, a Harvard public health researcher, Brigham and Women’s Hospital surgeon, and *New Yorker* staff writer. —Erica Lloyd

On his precision medicine initiative

Part of our goal here is to shift from what is really a disease care system to an actual health care system.

We’re being very intentional about making sure that we are reaching out to communities that sometimes are forgotten, whether it’s African American communities or women, so that we can really pinpoint what works for whom.

On making innovation possible in the health care system

Even as we’re doing all this cool stuff to come up with greater cures, what we’re also having to do is try to figure out what are the incentives, the perverse incentives, that are set up in the health care system that prevent [information] from reaching a patient earlier.

On privacy and cybersecurity

The opportunities to hack your information will be just as great or greater in a poorly integrated,

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VOICES FROM FRONTIERS

“I guarantee you will not meet as interesting and diverse a set of innovators and scientists . . . for the rest of the year.” —Robbie Barbero, White House Office of Science and Technology Policy

[There’s incredible imaging and science in meteorology,] “yet we are still really impoverished in our knowledge about what’s going to happen with that individual storm [like Hurricane Matthew striking inland so forcefully]. . . . With the EMR—electronic meteorology record, I like to call it—small perturbations from the record have an enormous impact on life. It’s like the precision medicine initiative.”

—Eric Dishman, Director, All of Us, NIH Precision Medicine Initiative

“We have *Star Wars* medicine in a *Flintstones* [health] system.”

—Freda Lewis-Hall, Chief Medical Officer, Pfizer

“Scenes of parasites, disease, invasion, and suffering have been woven through [life’s evolving] tapestry throughout history. But now, that can change.” —Kevin Esvelt,

Assistant Professor, MIT Media Lab

“What would a medical selfie look like?” —Steven Keating,

MIT Engineer, Patient Advocate

“Can you imagine what happened when the first woman built a controlled fire? [Maybe her people were concerned], but they were warmed by it.” —Tim O’Reilly, CEO, O’Reilly Media

“It’s about time for another giant leap for mankind.” —Rod Roddenberry Jr.,

CEO, Roddenberry Entertainment
(President Obama has confessed, unapologetically, that he’s a big fan of *Star Trek*, which Roddenberry’s father created.)

“Thank you so much for the world we are going to have in 50 years. It’s going to be better.” —Zoë Keating,

Cellist, Composer, Patient Advocate



Obama: continued

broken-down health care system as it will be in a highly integrated, effective health care system. So I think it's important for us not to overstate the very real dangers of cybersecurity and ensuring the privacy of our health records. We don't want to so overstate it that that ends up becoming a significant impediment to us making the system work better.

On the value of informed debate

One of the ironies . . . of the Internet has been the degree to which it's bringing us unprecedented knowledge, but everything on the Internet looks like it might be true.

Any scientific revolution is by definition contesting the status quo. And we're going through a period in which our knowledge is expanding very quickly. It's going to have a wide range of ramifications, and you've got a whole bunch of legacy systems that are going to be affected.

On keeping information curators in our modern world

The most important curator to be able to sort through what's true and false, and sustain those scientific values, is the human brain; and [we're] making sure our kids are getting that ability to analyze and do that sorting early. And so part of the reason why we've been emphasizing STEM education is not because we don't value the humanities—I was a political science and English major, and I've probably learned more reading novels than textbooks. What [STEM] does is help everyone as citizens. Even if you don't become a doctor or a scientist or a physicist, it helps you evaluate information in a way that allows you to make good decisions in your own life but also allows you to participate in the country as a whole.

On the advice he gets from tech leaders in the private sector

Government will never run the way Silicon Valley runs because, by definition, democracy is messy. This is a big, diverse country with a lot of interests and a lot of disparate points of view. And part of government's job, by the way, is dealing with problems that no one else wants to deal with.

So sometimes I talk to CEOs; they come in and start telling me about leadership, and, *Here's how we do things*. And I say, *Well, if all I was doing was making a widget or producing an app, and I didn't have to worry about whether poor people could afford the widget, or I didn't have to worry about whether the app had some unintended consequences . . . that would be great*.

Sometimes we get, I think—in the scientific community, the tech community, the entrepreneurial community—the sense that we just have to blow up the system, or create this parallel society and culture, because government is inherently wrecked. No, it's not inherently wrecked; it's just government has to care for, for example, veterans who come home. That's not on your balance sheet, that's on our collective balance sheet. . . .

Let's get to work.

See more of the White House Frontiers Conference online: frontiers.pitt.edu and frontiersconference.org

PRESIDENTIAL INVITES

A \$4.2 million grant from the National Institutes of Health will help Pitt recruit study volunteers and collect their biological, genomic, and lifestyle data for **President Barack Obama's precision medicine initiative, now called All of Us**. The grant could total up to \$46 million throughout the next five years. "The program will focus not just on disease, but also on ways to increase an individual's chances of remaining healthy throughout life," a White House news release says.

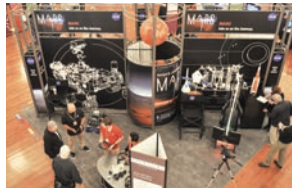
Pitt's Clinical and Translational Science Institute—with **Steven Reis**, MD associate vice chancellor for clinical research, health sciences, professor of medicine, and CTSI director as principal investigator—is leading data collection through an effort called Precision Approach to healthCARE (PA CARES). His team plans to recruit 10,000 patients in the first year and 175,000 people total as part of Obama's goal for 1 million enrolled by 2020.

It's perhaps no surprise that the content of a person's saliva affects his dental health—but are there hints of heart disease swimming in there, too? Pitt's new Center for Medicine and the Microbiome (CMM) faculty aim to find out.

In conjunction with the School of Dental Medicine's **Alexandre Vieira**, codirectors of CMM **Alison Morris**, an MS and MD, and **Barbara Methé**, a PhD professor of medicine, have collected saliva samples of more than 3,500 people to examine what microbes teem between our teeth. Then they will connect those findings to each anonymized patient's electronic health record.

"We have the ability to really look at how the microbiome impacts disease in well-phenotyped cohorts," says Morris. **CMM's efforts are part of the National Microbiome Initiative**, supported by the White House.

This July, **Ivet Bahar** was invited to speak at the White House as part of the **National Strategic Computing Initiative**. Bahar, a PhD, is a Distinguished Professor who holds the John K. Vries Chair of Computational and Systems Biology at Pitt. The NSCI was established to support the development of faster computations so researchers can tackle larger, more complex systems. "The idea is to extract useful information from extensive data," says Bahar, noting this is especially important in this "postgenomic era" of the life sciences. —*Robyn K. Coggins*



Frontiers had five tracks—personal, local, national, global, and interplanetary—plus exhibit halls and a plenary. Pitt's **Jeremy Berg** (editor in chief of *Science*) is shown above (second row) with Chancellor **Patrick Gallagher**. Hundreds of science luminaries, as well as students and patients, participated. (Pitt student **Jesse Irwin**, nominated for a regional Emmy Award for hosting *Pitt Tonight*, live-streamed from the conference; he's shown stalking a robot on the exhibit floor.)