White House Science Fair celebrates student research
By Emily Conover

JONATHAN ERNST/REUTERS President Barack Obama listens to a pitch by 14-year-old Nikhil Behari, who created a biometric security system that identifies unique users based on their typing styles. Behari says his system—on display at the 2015 White House Science Fair—is 98% accurate.

Sixteen-year-old Sophia Sánchez-Maes is all about algae. The slimy green stuff is an attractive candidate for biofuel production, but Sánchez-Maes wondered why the biofuel startups near her hometown of Las Cruces, New Mexico, weren’t having more success. “I’d heard all these stats about how awesome algae was and the potential, but I just wasn’t seeing it in my everyday life,” she says. “I kind of wanted to fix that.” After doing some digging, Sánchez-Maes found that the algae operations near Las Cruces were putting more energy into fuel production than they got out, so she set out to pioneer a new process that produces a positive energy yield.

The result earned Sánchez-Maes a coveted spot in Monday’s White House Science Fair, where more than 100 elementary, middle, and high school students shared their research with President Barack Obama and other government officials. “We’ve got to celebrate the winners of our science fairs as much as we celebrate the winners of football or basketball or other athletic competitions,” Obama said in a speech honoring the students. The young scientists and inventors studied topics that ranged from carbon dioxide–powered batteries to software that identifies breast cancer–causing genetic mutations to spine implants for young scoliosis patients.

Sánchez-Maes began her research by computationally modeling algae growth to determine how biofuel companies could optimize their operations. But, she says, this was “only the tip of the iceberg” for challenges that biofuel operations face. She then worked to develop a process that eliminates the most energy-intensive part of the biofuelmaking process—drying the algae and extracting its lipids. The new method involves “pressure-cooking”
the algae and using catalysts to make the process more energy-efficient. But Sánchez-Maes didn't stop there. She is now studying a type of algae that feeds on contaminants in wastewater, eliminating the need for sunlight that can hold back some biofuel plants. Thanks to a collaboration with researchers at Stanford University and New Mexico State University, among others, a wastewater treatment plant in her hometown is now demoing the technology. “She’s helping to bring the world closer to using algae as a clean, renewable, and even inexhaustible energy source,” Obama said.

Sánchez-Maes wasn’t the only student to focus on biofuels. Eric Koehlmoos, 18, ran a biofuel project from the most unlikely of places—his basement. Because it was a several-hour drive from his home in rural Granville, Iowa, to the nearest lab, he labored mostly alone on his project: the production of ethanol from prairie cordgrass and switchgrass. He found that by treating the grasses with calcium hydroxide, or lime, he could boost ethanol production in certain grasses by 80%, making it a viable alternative to corn-based ethanol. The grasses can grow on land that isn’t suitable for corn or other crops, and byproducts could serve another purpose—cattle feed. To get started on his project, Koehlmoos consulted with a local ethanol plant and researchers at South Dakota State University. "Without them, I probably couldn’t have done my project," he said.

Other students focused on cybersecurity and computer technology. One of them—Nikhil Behari, 14—developed a protocol that may one day protect your Facebook page from hackers. Using a system that measures the amount of time and pressure unique users apply to their keystrokes, the Pennsylvania student created a protocol he says is more than 98% accurate in identifying individuals. Just as we all have distinct fingerprints, each person has a unique typing style, which a computer can detect to ensure your password hasn’t fallen into the wrong hands. Participating in the fair, Behari says, was inspiring. “I’ve met so many amazing people, and … they’ve given me even more motivation to do the science and work that I’ve been doing.”

In his remarks, Obama emphasized the importance of continuous support for science research and education, announcing an additional $240 million in funding for the administration’s Educate to Innovate program. “It’s not enough for our country just to be proud of you,” he told the students. “We’ve also got to support you.”

This year’s science fair—the fifth since it was launched in 2010—emphasized the importance of including minorities and women in science. Participants included first-generation Americans and a troop of 6-year-old Girl Scouts from Tulsa, Oklahoma. The girls, just beginning their first adventures in science and technology, created a machine made of Legos that automatically turns book pages to assist disabled people.

“Science is for all of us,” Obama said. “And we want our classrooms and labs and workplaces and media to reflect that.”