

Hunting the Neutrino-less Double Decay: Students May Not Win the Nobel, But It's an Internship to Remember

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(left to right) Azriel Goldschmidt, Berry Grant, Martin Hawron, Clayton Martin and Abdel Bachri and the equipment for their research into the neutrino-less double decay.

During the first summer Abdel Bachri and his physics students at Southern Arkansas University spent at Lawrence Berkeley National Laboratory they accomplished something that would've been impossible back home: they built a portable cosmic ray detector, with the help of advanced equipment and expertise unavailable at their university. Then they brought it back to Arkansas to allow other students to use it to learn about radiation. "It's my understanding it's the only detector of its type in the state of Arkansas," Bachri says.

If that was cool, this second summer is proving to be even more exhilarating. Under the mentorship of Berkeley Lab nuclear scientist Azriel Goldschmidt, the [students](#) are helping in the hunt for the neutrino-less double decay, one of the rarest decays in nature. Many top scientific teams around the world are on the hunt to confirm this phenomenon, which would demonstrate that physicists' [standard model](#) of particles is incomplete and will very likely bring a Nobel Prize to the winning team.

"It's very, very exciting that we have a chance to work with these people on an experiment such as this," says student Berry Grant. Adds student Clayton Martin: "If the Berkeley Lab scientists are the ones that prove that this happens, we can sit at home and watch the Nobel Prize ceremony and say, 'that was us.'"

Both Grant and Martin are seniors majoring in physics at Southern Arkansas. Along with a third student, Martin Hawron, and Bachri, their physics professor, they are spending 10 weeks at Berkeley Lab as part of the Faculty and Student Teams (FaST) program. FaST faculty spend three consecutive summers at Berkeley Lab, each time bringing two or three undergraduates for paid internships, thus giving an enriching educational experience to the students as well as valuable opportunities for career development for the faculty members.

FaST is one of more than a dozen educational and internship programs offered by Berkeley Lab's Center for Science and Engineering Education (CSEE). Funded by the Department of Energy, FaST gives preference to applicants from minority-serving institutions and colleges and universities that receive less-than-average federal funding.

"When I first came to [Southern Arkansas] university, I realized the infrastructure didn't allow for any stimulating research for students," says Bachri. "I started looking for some options to have them get some meaningful research experience, which we're not able to do back home

due to lack of resources. I came to learn about the FaST program, which allows teams to come and use the intellectual resources of Berkeley Lab, so of course I couldn't resist that."

The program is stimulating for the mentors as well. "It's exciting to see them learn and get excited about new things—that's my main motivation," says Goldschmidt. "Also, the FaST program is geared towards institutions that are at a disadvantage, so we're taking folks from very different backgrounds and putting them here, which is at the forefront of science. They come in touch with a lot of stuff they otherwise would not have had the opportunity to do."

For some students, a summer at Berkeley Lab has shattered their stereotypes about scientists. "I had a certain idea of what a scientist looked like before I got here," says ShaRonda Pickett, a junior majoring in biology at Langston University in Oklahoma. "I thought they'd look all nerdy, but they're really cool, very laid back, and they get the job done."

Pickett, along with her biology professor Byron Quinn and two other students, are spending the summer learning about protein crystallography with Berkeley Lab scientist Paul Adams and his group, which developed PHENIX, a software program that automates the determination of molecular structures. The students have learned how to program in Python and are designing programs to fit ligands and navigate through a protein database.

"None of us had a background in programming," says Justin Williams, a junior at Langston who plans to go to medical school. "It's showed me a whole other side to the science field, and I've learned some things about proteins. It's taught me a lot."

Another FaST team, Sarah Meiss and her biology students from California University, located outside Pittsburgh, Pennsylvania, are

working in a lab under the mentorship of scientist Tamas Torok. Meiss brought her own project with her: analyzing agricultural soil to catalog the microbial populations of soil from large, industrial farms and compare it to soil from smaller farms.

“The lab experience is completely different from being in a classroom,” says student Mike Keeling, a senior who plans to go to medical school. “It’s almost as if we’re getting graduate level experience. I feel much more comfortable working in a lab now.”

Adds his classmate, Alyssa Grushecky: “In school, if you’re learning about something one week, you do a three-hour lab in class, and you never do it again. I forget it the next day. Here you’re doing it over and over again. I can do DNA extraction with my eyes closed now.”

For Meiss, the experience has helped her focus on her own research as well as her teaching. “I feel like I really have an idea of what I want to do for the next 20 years,” she says. “Tamas is a great host. He teaches me how to do things, helps me understand what I can and cannot do, and lets me do it. So when I go back to school, I think I’m going to try to incorporate more of that type of learning, experiential learning, and let students try things out for themselves, let them choose what they want to explore.”

Provided by Lawrence Berkeley National Laboratory

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