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CMU now offers track in quantum physics, thanks to advocacy from a student

Maddie Aiken | December 27, 2024



Andrew Rush/Post-Gazette

Claire Gist became interested in quantum physics in middle school.

Her appreciation for the field grew in high school, and when it came time to apply for colleges, Ms. Gist knew she wanted to focus her studies on it.

Though Carnegie Mellon University didn't offer a quantum physics major or track at the time, Ms. Gist was drawn to the elite university's courses related to the field.

But now, CMU does offer a quantum track in its physics major — largely due to Ms. Gist's advocacy.

"I was looking at the [courses offered] and thought, 'Quantum would fit here,'" said Ms. Gist, who is originally from central Virginia. "I knew there was enough there that could reasonably make a track... and the department ended up really liking the idea."

Ms. Gist proposed the track during her freshman year. CMU began offering it in March, two years after Ms. Gist's suggestion.

This spring, Ms. Gist, now a senior, will graduate with a bachelor's degree in physics with the quantum track.

This track is now the sixth that CMU offers within its physics undergraduate program. Other physics tracks include applied physics, astrophysics, biological

physics, chemical physics and computational physics.

These tracks allow students to complete their general degree while gaining additional expertise in an area they're interested in, said Rachel Mandelbaum, CMU professor and interim head of the physics department.

Students who pursue the quantum physics track, for example, must take courses in theoretical and applied quantum physics. Research in the field is also required for undergraduate students.

"It's a way of providing additional educational opportunities to students with particular interests," Ms. Mandelbaum said.

At its core, quantum physics is the study of matter and energy at the most fundamental level, below the scale of atoms. Ms. Gist is specifically interested in quantum thermodynamics, which studies

how heat and temperature apply to the quantum realm.

Students who study quantum physics can get jobs in careers related to quantum computing, quantum materials and other technology-related fields.

The industry is exploding in growth, with the quantum technology market size estimated to expand to \$106 billion by 2040, according to the University of Chicago. The United Nations has proclaimed 2025 to be the International Year of Quantum Science and Technology.

By offering a quantum physics track, CMU allows students to graduate with this area of interest on their diplomas and resumes, Ms. Mandelbaum explained.

"It's a way of signaling to [prospective students] in a very direct way that we have the opportunities that they are looking for in our department," she said.

"Different physics departments have different strengths, and it's important to be able to convey that to the students as they're trying to make educational choices."

Looking to her future, Ms. Gist hopes to study quantum thermodynamics in graduate school after she completes her undergraduate degree. She believes this track will bolster her opportunities.

"Having a track that goes on your diploma is very useful for credentials," Ms. Gist said. "The fact that [I] can say, 'Yes, I focused on [quantum physics] at Carnegie Mellon'... it's very useful."