



CODING ACROSS DISCIPLINES

UNI offers a wealth of research opportunities for undergraduates, both during the school year and as part of the Summer Undergraduate Research Program (SURP). SURP allows undergraduate students to work closely with a professor on a scientific research project over 10 weeks. The SURP students are paid for their research work.

Mary Sutton, a Junior Biochemistry and Physics major, has done her research both as a part of SURP and during the school year. She has been working with Dr. Ali Tabei on a research project that incorporates both of her majors, as well as new skills she has learned in coding throughout the experience. Mary and Dr. Tabei presented the project at the SURP Symposium at the end of summer. The title of the project, which sounds intimidating at first, was *Stochastic Lattice Simulation of the Rad51 Nucleoprotein Filament Formation on Single-Stranded DNA*.



Mary Sutton presenting her research at a conference

"Dr. Tabei sent an email out during winter break of my sophomore year. He said that he was looking for people who had an inter-departmental interest and wanted to combine both biology and physics knowledge into working on a research project," she said, explaining how she became involved in undergraduate research.

For this project, Dr. Tabei, along with Mary and other students, have been teaming up with a lab at the University of Iowa. The lab belongs to Dr. Maria Spies, Professor of Biochemistry and Radiation Oncology at the University of Iowa. She is studying how a protein called RAD51 binds to DNA. RAD51 is a tumor suppressor. The goal of their research is to see how fast it binds to DNA and what factors make it bind, hopefully leading to anticancer therapies using the protein.

"And so my job," Mary said, "is to simulate how that protein binds to DNA using computer codes."



Crystal structure of a Rad51 filament. Conway, A.B. et al - RCSB Protein Data Bank

The next step involving Mary's work with the simulations is to compare them to the data gathered in Dr. Spies' lab from actual binding events. Using Mary's code, they could run thousands in a few seconds. Running many simulations allows Dr. Spies to select only the most promising tests to do in the lab. So, if the simulations are accurate, the lab will not have to run nearly as many physical tests. Doing fewer physical tests saves time and resources.

Mary learned a lot throughout her research experience. She has presented her poster at various conferences, including the FUTURE in Biomedicine Conference and the UNI SURP symposium. The SURP Symposium is held annually by the College of Humanities, Arts, and Sciences and brings together SURP students from 6 or more departments to present their research projects. Mary said the experience helped her improve her presentation skills, and also helped her to work on time management and working with a team towards a clear goal. However, those are not the only skills she has gained.

"Beginning this experience I had no computer coding knowledge at all. And now I've made dozens of simulations of biology events. It's really cool! I've learned how to code using MATLAB, and that's really helped me in my other classes because I've been coding in them so I can kind of use that knowledge," she said.

"The reason I wanted to do it is because it looks good in graduate school to have had research opportunities, but it's also a really good way to explore other career paths," Mary said. "I never would have thought of myself as a programmer or a physicist before I did this project."

*To learn about Mary's research and that of other SURP students, visit
<https://scholarworks.uni.edu/surp/2019/>*



Story by

Brooke Wiese

Graduate Assistant

Communicating STEM

wiesebab@uni.edu

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UNI STEM

229 East Bartlett

319.273.7399

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