Fuse explains, “Insects use the same neurotransmitters as us in their nervous system.”

Fuse and her graduate students have irradiation experiments, the team is using a molecular analysis process called tunel labeling—a method by which researchers can identify irradiated, damaged DNA. Humans undergoing chemotherapy or radiation treatment often experience the side effects of hair loss or nausea. This is because chemo- and radiation treatments are rather indiscriminant in their action, attacking fast-growing cells in the human gut and hair follicles along with rapidly dividing tumor cells. Fuse’s group can use tunel labeling to closely monitor this sort of incidental damage and verify that during irradiation, hornworms only experience cellular damage to their highly proliferating, or cancer-like, cells.

Among their many projects, Fuse and her students are also utilizing flow cytometry as a blood analysis tool. Flow cytometry enables researchers to monitor cellular diversity and cellular activity in the blood. This includes telling us “what is being activated to address dying cells,” Fuse explains. Flow cytometry can also sort and count various types of cells in a blood sample. This is particularly useful since the hornworm’s immune system is considerably dissimilar to our own. Hornworms, like many invertebrates, lack the white blood cell defense against pathogens or foreign bodies in the bloodstream that humans utilize. Instead, the hornworm relies on hemocytes, or patrolling cells that indiscriminately attack foreign bodies that enter the hornworm’s blood stream. Hemocytes, Fuse explains, are “analogous to macrophages in the human immune system,” serving as a circulating, cellular immune surveillance system. With flow cytometry, they can directly study this form of immunity.

While touring the Fuse Research Lab, visitors can witness an environment buzzing with activity. Specialized enclosures house hornworms at various stages of development and strategically cluttered workstations dot the walls. Upon closer inspection, the hornworms take a backseat to the real star attraction—the students. At its core, Fuse’s lab contains a community of diligent undergraduate and graduate students who share an intense interest in scientific research. When Dr. Fuse enters the lab, she receives a volley of cheerful greetings from around the room. Her candid conversations with students meander from pure science, to pure science fiction, and any eavesdropper can easily decipher that the relationships in the lab are just as vital as the research. “I chose this university because of the fact they valued service as much as teaching and research,” Fuse says, “and that’s still the most rewarding part, the outreach toward students.”

Fuse—curiously once a promising music student—describes how a chance intersection with an assertive female biology professor changed the direction of her life. “I was just so taken by how strong she was, how passionate she was that (biology) should be as much a priority to me as the music program,” Fuse recalls. Fuse has become this same pivotal figure in her own right, guiding the academic careers of countless students at SF State.

“One of my missions in the lab is to get students into Ph.D. programs,” admits Fuse with a warm smile. “I feel like we’ve been very successful at that. I’m very proud of that. It’s not about me, it’s about the students.” According to her former student Sayed Miry, Fuse “grounded herself through quality mentorship. Ultimately, Fuse’s greatest prestige may come from her lasting student outreach. Former SF State graduate Sayed Miry, entering a Ph.D. program in New York this fall, comments, ‘What I value most from her teaching. His mathematical studies on super-symmetry offer new insights into quantum mechanics and quantum field theory. SF State grad student Steven Li, 29, uses the mathematics of harmonic analysis to sort sounds based on frequency and content. Li plans to become a statistician after earning a Ph.D. Ph.D. in statistics.

Cindy Kelly, 30, is developing algorithms that allow computers to make decisions based on experimental data. After completing his Master’s in computer science from SF State, he hopes to continue Ph.D. work in that field and become a high-tech entrepreneur.

Shermer, Li, and Kelly have significantly different academic interests, but they share two things in common: All are graduate students in SF State’s College of Science and Engineering (CSE), and all have received $10,000 ARCS Foundation Scholar Awards. Through COSE students like these, the prestigious grant program has advanced its identified aim: helping promising science students to offset educational costs so they can dedicate more time to their studies. The same process is also helping deserving scholar Shermer, Li, and Kelly to reach personal goals that will ultimately benefit society.
The Northern California chapter of ARCS Foundation (ARCS Foundation NCC) gives money to five local schools in addition to SF State: Stanford University, UC Berkeley, UC Davis, UC San Francisco, and UC Santa Cruz. At each of the five schools, the $10,000 grant goes to Ph.D. students. SF State is exceptional in that, Master’s candidates receive the large stipend. Since its founding in 1970, the ARCS Northern California chapter has raised $15.2 million. In addition, a monetary aspect, ARCS recognition will benefit, ARCS recognition will help their educational goals. “It definitely helps in a monetary aspect,” he says, “and it’s a prestigious prize that looks good on resumes and applications for other things.”

Scott Shermer commented, “I’m really happy that I received the grant because it’s going to really boost my curriculum vitae.” He went on to say, “I think it’s important to me to continue to be supported by ARCS Foundation, as he furthers his education elsewhere. “I want to get my Ph.D. and then just hopefully teach and do research” he says. “In terms of getting into a Ph.D. program, getting the award is only going to help me.”

Cindy Haueter says, “They are doing hands-on research at San Francisco State, way more than other Master’s programs. They are concentrating all of that brain power on producing Master’s degrees, giving their scholars so much research opportunity.” She cites the “many parallels” between SF State’s mission and the ARCS Foundation’s own. “They’ve figured out their audience,” she says, “and recognized that the community with a wealth of world class Ph.D. programs, they have a unique niche where they can concentrate on doing an exceptional job at what they do: producing first class Master’s degree students. SF State Foundation also provides an opportunity in the life of those who are very serious about the field they are pursuing. Their focus is on doing what they do, and they’re doing it right. That’s what makes them unique and that is why we continue to fund at San Francisco State.”

Sheldon Axler, Dean of the College of Science and Engineering, applauds the work of the ARCS Foundation and its benefits to SF State recipients. “The real advantage to students is, if you get a $10,000 scholarship you can probably reduce your other work that you’re doing. So really what it buys you is time. It’s the most important thing when you’re a graduate student… you can devote yourself 100% to your studies, your schoolwork and to your thesis work instead of that job that is going to take time and energy. That, to me is really what it buys: time for students to concentrate on their academic. And that’s a huge advantage.”

Steven Li echoes this view, explaining how receiving the ARCS Foundation Award greatly urged his workload. “When I first started my research,” he says, “I was teaching and taking classes. So, I was very busy and was here kind of late at night because I had all these other responsibilities as well. With the award, I didn’t have to teach here at SF State anymore. So that freed me up, which was good because I got more time to focus on my research. I definitely have invested a lot of time on this because it’s an extremely difficult topic.” Li is currently working with biology professor Edward Connor at the interface between biology and mathematics, employing harmonic analysis to locate and identify birds by their calls. Li believes that, in addition to the monetary benefit, ARCS recognition will help further his educational goals. “It definitely helps in a monetary aspect,” he says, “and it’s a prestigious prize that looks good on resumes and applications for other things.”

And it’s “philanthropic investment,” she continues. “It’s a wonderful group of women–I applaud them because of the tenacity of their pursuit. If they didn’t do what they do, we wouldn’t be able to happily be writing checks at the end of the year.”

Haueter, originally from the Peninsula, was president of the Northern California chapter for two years. Along with the many women volunteers in other ARCS chapters, she helps to further the organization’s dual missions of advancing U.S. science and supporting top graduate students. Explains Haueter, “We would rather have our funding concentrated on somebody who is already committed and has already brought into being in that pipeline of concentrating on doing research, and of giving something back. This is about recognizing somebody and allowing them to continue on to their path [forward] doing something great.” The work is “philanthropic investment,” she continues. “It’s about putting your money with a student who you know will go on. And the rewards that will be realized will be for not just the student but also for our whole community.”

ARCS Foundation must meet specific criteria. They must be United States citizens, have a minimum 3.5 GPA, have financial need, and be in an approved scientific program or department. The ARCS Foundation NCC awards mostly Ph.D. candidates because they are already invested in their field and are therefore more likely to work as professionals or academics in science for the rest of their career. “Not everyone is going to knock the cover off the ball,” Haueter says. “But this Award provides an opportunity for them to continue on and concentrate on their research. You never know where the greatness is going to come from, but it’s all about investing in our community and in our country.” She adds, “The students coming out of SF State seem to have an incredible loyalty to the Bay Area, often returning to work or teach in this area. So we feel, almost doubly so, that they are an incredible investment to our local community, as well as their potential contributions to our national community.”

Although she led the Northern California chapter from 2010-2012, Haueter spent many years working in ARCS Foundation’s University Relations Committee. There, she interacted closely with top science students. “I worked in University Relations for probably six or eight years,” she says, “and really developed wonderful relationships on the campuses. For me it’s about the students.” Haueter’s warm, enthusiastic disposition comes across most clearly when she recalls the students she has worked with. “I run into them and I feel like I’m a mom. I’ve got all these kids and are my kids and you get involved. You want them to succeed.” This dedication to the organization’s mission and her genuine interest in helping students has both kept Haueter involved in ARCS Foundation and earned her the leadership role.

“I am passionate about it!” she exclaims. While some members “can write a check, I can’t write the check. But I can spend the time. For me,” she adds, “these are personal reasons why I am a huge supporter. I love not only what they do and how they do it but the fact that it is a total way of fertilizing the science community in this area—because our scholars come back. They bring back so much scientific wealth. It is the epitome of what ARCS means to our philanthropy.”