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faculty spotlight

Undergraduates and Research: From the Side of the PI, Dr. Sadanandan Velu

Miranda Collier

Dr. Sadanandan Velu has served as a mentor to no fewer than 20 undergraduate students since he joined the UAB Department of Chemistry as a faculty member in 2004. His students have gone on to present their work at regional conferences, publish in various journals, win scholarships and awards, and pursue research-oriented careers. Inquiro set out to discover what Dr. Velu seeks in undergraduate research students, how they contribute to his lab, and how involvement in research at an early stage prepares them for the future.



Dr. Velu received his doctorate in synthetic organic chemistry from the University of Madras in India. He was not involved in research until his graduate studies. “In India, we never had opportunities as undergraduates to do research,” he explained. “I tell my students at UAB they are fortunate to have these opportunities.” He came to UAB in 1997 to conduct research in the Medicinal Chemistry division of the Center for Biophysical Sciences and Engineering. Since 2004, he has been in the Department of Chemistry conducting research in the area of drug discovery.

“There are different approaches to this type of research,” he explained. One method used in his lab is to identify molecules with medicinal properties from natural products, specifically from chemicals existing in marine invertebrate animals, such as

mollusks and sponges. As a marine natural product chemist, his goal is to synthesize these compounds and their analogs and identify new lead compounds for drug discovery. Why marine animals? “These compounds are very bioactive,” he explained. “Often they have anti-cancer properties. These organisms live in a unique environment under the ocean. Their bodies make adaptations for survival. They use these chemicals – unique compounds that are not found in terrestrial organisms.”

Once useful compounds are identified, he tries to develop synthetic methods of making them in the lab. “We can’t rely on marine resources to get it. You get very tiny amounts, and it can be ecologically unfavorable if you try to harvest large amounts of marine organisms from the ocean. The practical solution is to make these compounds in the lab.” In addition to environmental issues, there are other advantages to synthesizing compounds as well. “You can modify the chemicals to optimize their favorable properties and diminish any unfavorable properties,” said Dr. Velu. Currently, his lab is using these methods in anti-cancer, anti-bacterial, and anti-parasitic drug discovery projects, among others. “Design of these molecules, optimization, structural activity relationship studies...the main part of all this is synthetic organic chemistry, and in my opinion, students are very comfortable working in the kind of research I do,” said Dr. Velu regarding the aptitude of undergraduates for his lab’s work. Students who have completed organic chemistry courses are able to join his lab and apply what they have learned to practical situations. “They are very excited about having a hands-on experience of conducting organic chemistry reactions in the lab. This area is definitely suitable for undergraduate organic research.”

For Dr. Velu, the most important quality in a student researcher is enthusiasm. “They should not take a research course just because they want to fill something in their resume. There should be passion and interest for it,” he said. He appreciates the energy and the inquisitive attitude undergraduates bring to his lab and to their weekly lab meetings. In addition to enthusiasm, discipline is another important trait that he looks for in interested students. “Often, students are used to taking classes and making ‘A’ grades. Research is not like that,” he asserted. “There is uncertainty involved. You could very well be spending a lot of time working toward something and have unfavorable results. You should be prepared to handle that kind of disappointment and overcome it.”

While he expects decent grades, especially in Organic Chemistry I and II, they are secondary to the personal attributes necessary in a competent researcher. In his experience, Dr. Velu knows that grades, passion, diligence and research affinity are not necessarily

always connected. “I have seen a lot of students with lower grades doing very well in research, and also students with very high grades not doing as well,” he cautioned, evidencing that each student’s aptitude for research is unique.

According to Dr. Velu, the primary benefit to being involved in research as an undergraduate is gaining experience and becoming familiar with the diligence and commitment associated with the field. “The success of the research is secondary,” he said. “I want them to learn. It is good to get a feel for this area early on before they start graduate school. If it leads to publications and presentations, all of that will help them further.” He believes it is important that students work in different labs to find a type of research that interests them. “They may not be able to solve one of the world’s big problems. This time is too short,” he explained. “The ultimate goal is to get the experience. Then they can make a decision: is research the best option for me?”

When undergraduates participate in research, it not only benefits them, but their mentors, departments and schools as well. “It helps me that they are flexible,” said Dr. Velu. “With post-docs and graduate students, it is often difficult to explore a new idea. But with undergraduates, I really like being able to try out the feasibility of novel projects.” He highlighted the positive impact of accomplished undergraduates on the school’s reputation. “When our undergraduate students are winning awards, publishing papers, making presentations...we are all benefited. The department and UAB as a whole.”

He believes that both student and mentor have responsibilities to uphold. “I ask that students be prepared. Research is not like taking a course. It’s a little more involved,” he explained. “There has to be an adjustment to be more disciplined, more committed.” As a mentor, he takes care to set reasonable goals and expectations for undergraduates. “I want them to be successful, but I must remember that they are young. They are trying to see if research is a career option.”

When asked how interested students should begin the process of becoming involved in research, Dr. Velu offered specific advice. “The first thing to do is check out the websites of research-active faculty. See their publication profiles,” he said. “Then make a short list of people who do research in the areas you are interested in.” The next step is to send out e-mails. “Ask if they are available for a short chat. They can clarify if they want undergraduates in the lab.” If a student follows these steps, Dr. Velu believes they will be able to find possible mentors in areas of research they want to pursue. To students who may not be interested in any specific area, he advised, “Go read! You may find something on a faculty member’s website that stands out to you. That grabs your interest and gives you some direction.”

Overall, Dr. Velu regards undergraduate research students and their work very highly and encourages everyone to become involved. “I would not rate the efforts of undergraduates any less than anybody. They can make significant contributions,” he said. “They can switch labs and explore. Do I like biochemistry? Drug discovery? Or

“It opens up all sorts of opportunities you would never have had otherwise. People doing high profile research have contacts all over the world...”

Further benefit to undergraduates comes from the relationship between a student and his or her mentor. “In research, you get to know the student very well, in a one-on-one basis,” said Dr. Velu. “We can write very strong letters of recommendation for students, about how disciplined the student is in the lab, how methodical he or she is in carrying out the research, how they interact with others. Those are all important aspects people look for in applications.” In addition to letters of recommendation, research has extensive networking potential. “It opens up all sorts of opportunities you would never have had otherwise. People doing high profile research have contacts all over the world,” he pointed out.

something else?” He believes that undergraduates should attempt to discover which path is right for them, and each student who follows his or her passions to the lab is one step closer to finding an answer.