The REU Program, University of Idaho

The ultimate opportunity for undergraduate students to get immersed in life as a scientist

An intensive ten-week program for undergraduates, the **Molecular and Organismal Evolution Summer Research Experiences for Undergraduates (REU) Program** at the University of Idaho offers a unique scientific research experience in state-of-the-art research facilities with well-established field-leaders. Brainchild of **Prof David Pfeiffer**, Director of the Office of Undergraduate Research at the university, the program has been a huge success. Not only has it generated a plethora of publications, the majority of alumni go on to assume graduate degrees in science, technology, engineering and mathematical fields.

The Molecular and Organismal Evolution Summer Research Experiences for Undergraduates (REU) Program at the University of Idaho is based around the theme of molecular and organismal evolution. Under the supervision of a mentor, students work on unique individual projects carefully chosen to compliment the faculty member's on-going research. The program takes the students on a journey of scientific discovery, from the early stages of hypothesis development through to defending their findings at a one-day research symposium. Their cutting-edge approaches within established research groups creates an exciting and intellectually stimulating environment for all students. An overall goal of the program is to inspire undergraduates into undertaking postgraduate education and subsequent careers in the sciences.

PROGRAM STRUCTURE

The program covers all aspects of scientific investigation including hypothesis development, experimental design, data analysis, critical thinking and science communication. Initially, students work closely with faculty members but become more confident and independent as the program progresses. The program includes a variety of workshops and field trips and it is enhanced by weekly hybrid 'lecture-research seminars'. Here, researchers review basic evolutionary concepts before presenting current research from their own labs in order to provide students with real-world research examples and current questions. This also helps students place their research within the broader context of the field that they are working in. Presenters include host faculty members as well as invited speakers from other departments within the University of Idaho. Most of the students' time is focused around their individual projects, and the design of the research is completed in the first two weeks, although preparation begins even before students step foot on campus. Mentors work closely with their students to identify any issues and are given regular opportunities to discuss their results. The program culminates in a one-day research symposium. Students are required to present their findings, in both oral and poster formats. This unique experience equips students with invaluable skills required for communicating research at scientific conferences.

Not only do students gain hands-on research experience, they also carry out valuable professional learning activities, including workshops on research ethics and career development. All modules are designed to give a real feel of what life is like as a scientist. The ethics component requires students to work on case studies, reinforcing ethical concepts that they otherwise may never have contemplated when thinking about a future career in science, like issues involving studies on

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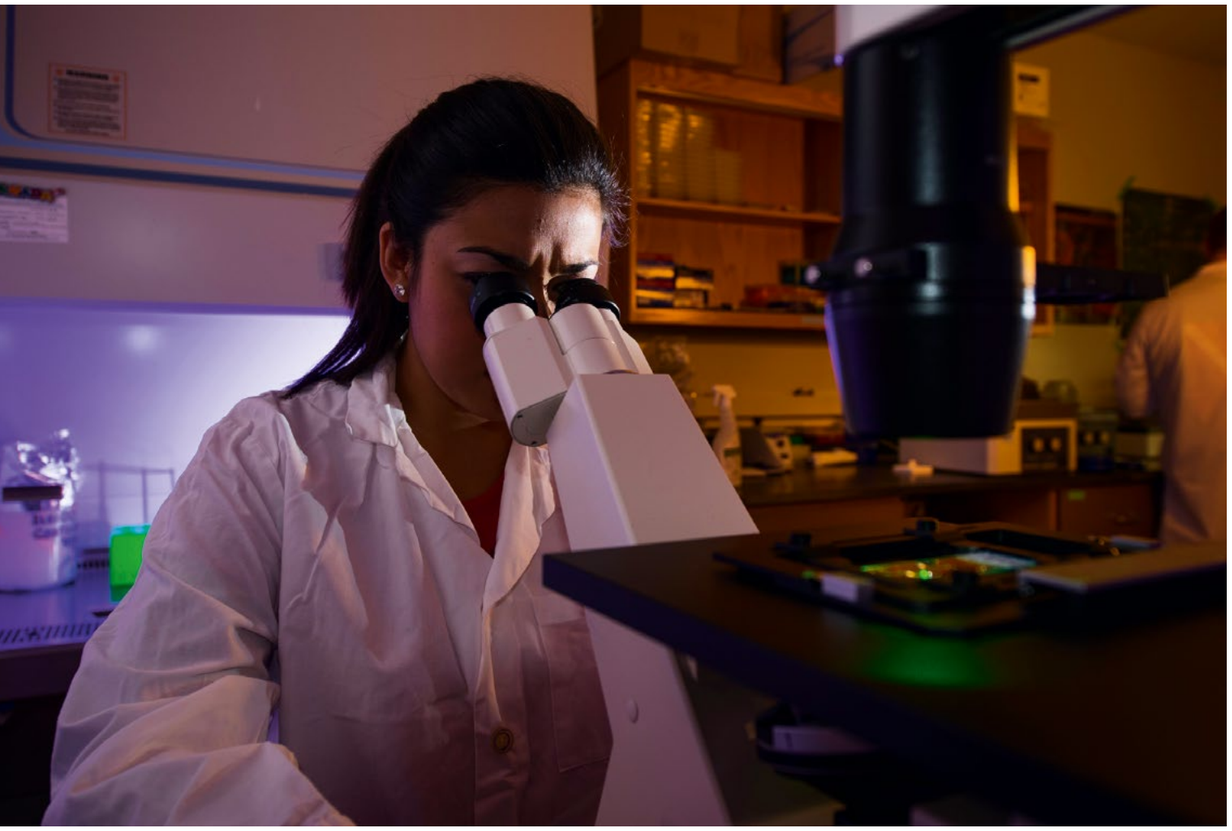

humans and animals, data sharing, and whistle-blowing. Career development workshops help students hone presentation and abstract writing skills, as well as prepare them for graduate school applications and inform them about the various career paths available to them.

RESEARCH THEMES

The research focus falls broadly within molecular and organismal evolution, areas in which the Department of Biological Sciences at the University of Idaho has considerable research expertise. The laboratories are well equipped with state-of-the-art technology, with research teams working across most biological kingdoms and viruses. Embracing the REU program with enthusiasm, sixteen faculty members serve as mentors, spanning an extremely diverse range of research: Dr Larry Forney's group are interested in bacterial community composition and their interactions, whereas Dr Eva Top is working on the genetics of bacterial antibiotic resistance. One REU student project recently used the zebrafish as a model organism to investigate the effects of hormones on optical genes and another used this model to investigate the teleost genome duplication event (a genome rearrangement event which took place approximately 300 million years ago). Other recent topics include the diversity of jumping spiders, the effect of sexual debut on the vaginal microbiome and designing molecular tools for detecting transmissible cancer in the Tasmanian Devil.

THE SOCIAL ASPECT

Despite a packed program, there is time for social interaction, and Prof Pfeiffer sees this as a crucial component of the program and a contributor to its success. For some students, this is the first extended time living away from home, and to create a cohort experience all students are housed together in on-campus apartments in the university student housing. This aims to facilitate student-student interaction, build camaraderie, and help students follow the progress of their peers.

The prime objective of the REU summer program is to engage students in all aspects of the scientific process and inspire them to become tomorrow's scientists. It provides them with the knowledge, competence and enthusiasm to pursue postgraduate education in the sciences and, ultimately, successful careers.

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Q&A

Why do you think your department is particularly suited to host the REU program?

A culture of engaging undergraduates in hands-on research is deeply embedded within the University of Idaho's Department of Biological Sciences. In fact, in several of its research labs the number of undergraduate researchers outnumbers the number of graduate students. This creates a welcoming environment for summer REU students and they join labs where they are viewed as productive and valuable members of research teams. Furthermore, the size of our department, with 30 tenure-track faculty members, provides a very large selection of potential research topics for REU students.

How is the mentoring of REU students different from the mentoring of graduate students?

Undergraduates differ from graduate students in several ways. Recognising and embracing these differences is essential for mentoring to be effective. While every student is unique, some common challenges encountered with new REU students include lack of research experience, lack of confidence, and differing levels of social and mental maturity. Our mentors take these differences into consideration and among other things spend more one-on-one time with new REU students than with graduate students. Importantly, our mentors work to foster competence and confidence in our REU students so that as our program progresses students develop independence and begin to function much like graduate students.

Are there any student cohorts that the program is particularly aimed at?

Our program aims for diversity in its student cohorts and we are particularly interested in including students from institutions with limited opportunities for research, students from underrepresented minority groups, and women students. To date, 60% of our students have been from non-PhD-granting institutions, 60% have been from underrepresented minority groups, and 80% have been women.

> **Students gain in confidence, independence and the ability to work like a scientist**

We are also interested in including first generation college students. 30% of our participants have been from the latter group.

What has the feedback been from the students at the end of the program?

Feedback, collected through an anonymous post-program survey, has been overwhelmingly positive. Students rave about the labs in which they work and the experience they gain. Significantly, they report personal gains in confidence, independence, and the ability to think and work like a scientist. Many report that our program helped clarify their career goals and state that because of our program they are now more likely to pursue graduate studies. Our students also reflect very positively on their overall cohort experience. They form long lasting friendships and maintain contact with one another well beyond the end of the program.

How do you measure the program's long-term success?

A key goal of our program is to positively influence undergraduates to pursue graduate studies in the sciences and ultimately enter the STEM workforce. Tracking the post-graduate education and career decisions of program alumni provides a direct measure of this. 70% of our program alumni who have now completed their baccalaureate degree have gone on to pursue graduate degrees in STEM. This is well over twice the US national average for graduates in STEM fields.

Detail

RESEARCH OBJECTIVES

Professor Pfeiffer's research focusses on structure/function relationships at the cellular, tissue and whole organ system level. At the cellular level, Professor Pfeiffer is especially interested in the organization and dynamics of the cytoskeleton, including its interaction with intercellular adhesion junctions.

FUNDING

National Science Foundation (NSF)

COLLABORATORS

Doug Cole, PhD, University of Idaho

BIO

Prof Pfeiffer earned his MSc and PhD at the University of British Columbia. A faculty member of the University of Alaska Anchorage, he taught first year medical students in the AK WWAMI Program and served as Director for the Office of Undergraduate Research and Scholarship. He joined the Department of Biological Sciences at the University of Idaho in 2014.

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