

Alfred University one of 21 institutions chosen for Joint Genome Institution Undergraduate Research Program

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Alfred University is one of only 21 institutions in the country to be selected for the federal Joint Genome Institution (JGI) Undergraduate Research Program in Microbial Genome Collaboration. What that means, explains Jean Cardinale, professor of biology in the College of Liberal Arts & Sciences, is Alfred University students will have a unique opportunity to participate in ground-breaking research: sequencing the genetic code of microbes. For the Joint Genome Institute, selecting just 21 schools to participate was difficult because of the higher-than-anticipated response. The Alfred University proposal submitted by Cardinale gained approval because the "application demonstrated the potential to enrich the curriculum with sequence-based research. We believe your approach has the potential to contribute to the national model for undergraduate research that we are collectively developing," Dr. Cheryl A. Kerfeld, education director of the JGI, wrote to Cardinale. The Joint Genome Institution Undergraduate Research Program in Microbial Genome Collaboration is only one piece of a larger, more ambitious program called the Genomic Encyclopedia of Bacterial Archaea (GEBA), Cardinale explained. Since work began on sequencing, or mapping, the human genome, there has been a "huge explosion" of interest in mapping the genomes of other organisms as well. Most of the microbes that have been done so far are within a "narrow taxonomic spectrum," generally those that cause diseases. Through GEBA, researchers will be studying a broader range of microbes, and using their genomic structure to classify them according to families, which, in turn, can provide a great deal of information about their characteristics. The work will be interesting, and it will feed into a much larger body of knowledge that is being accumulated, but the real benefit for Alfred University students will be in the courses that will be developed, and the skills the students will learn. Cardinale, who will be attending a JGI collaborators' meeting Jan 22-23, 2009 at the DOE's Joint Genome Institute in Walnut Creek, CA, will develop an upper-level course in bioinformatics and genome annotation for her students beginning in the Spring 2010 semester. Alfred University will be assigned a microbe to study, and each student will be given a particular genome, or section of the genetic code, to annotate, identifying and recording the proteins that make up the DNA (deoxyribonucleic acid, which is the hereditary material in humans and almost all other organisms). Once the DNA is sequenced, Cardinale said, the students will "look at the data and determine what the organism can do," and how traits correlate with its genetic make-up. She anticipates students will be able to develop their own novel research projects from their initial class work. "There is also the potential for them to publish their original work as well," something that will give the AU students an advantage if they pursue graduate studies in the field. The initial bioinformatics course will only be the start of how the JGI initiative will affect a wide variety of courses at AU, said Cardinale. There are already plans to use the annotation software, which Alfred University will receive as a collaborator; the University's DNA sequencing equipment, which the Division of Biology obtained through the proceeds of a bequest from Rosalind '39 and Elias '36 Fass; and the research from the genome project in other courses as well. "The chance to weave a common thread across the curriculum will be a powerful way to demonstrate the interconnectivity of their course work," Cardinale explained. Cardinale said that also beginning in the Spring 2010 semester, the lab portion of the course on genetics will use information gathered in the genome project to reinforce more advanced genetic concepts relating to gene regulation. In general biology, students will be introduced to bioinformatics through a simple lab activity. "We hope to intrigue them with what they might be able to do later on," Cardinale explained. In her course on biochemistry, students will look at how the organism metabolizes proteins and analyze the catabolic pathways. Depending upon the organism studied and its ecological significance, there are other courses that might also incorporate genomic analysis, she said. They include microbial ecology, microbiology, biostatistics, ecology, aquatic ecology, organic chemistry, and genetics and evolution of populations.