

Editorial: On the Cutting Edge—New Areas of Undergraduate Research

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American Journal of Undergraduate Research
University of Northern Iowa
Cedar Falls, Iowa 50614-0150 USA

Whether we get our everyday news from neighbors, newspapers or on-line blogs, news about the advance of scientific investigation into new areas is likely inescapable. Universities are opening multi-million dollar research facilities that span and extend older specialties, and entrepreneurs tout new technologies. Bioinformatics, nanoscience, and other cutting edge research areas are in play—certainly in R&D labs and graduate research groups.

What about undergraduate research in these and other cutting-edge areas? By this I mean research projects that principally involve undergraduates, not larger scale efforts that include undergraduates in league with graduate students and post-docs. Undergraduate research in this sense often is coordinated by a single researcher at a college or university. The necessary expertise is often only one person deep, and new cutting-edge areas usually require a recent-PhD faculty member to make them a reality. Certainly courses and programs in cutting edge areas help steer students into related research programs, but these require significant coordination. Hiring faculty and establishing courses and programs are both labor intensive. How likely then is undergraduate research in a cutting-edge area?

Bioinformatics, as one of the more established interdisciplinary areas, offers an example. The US NIH Biomedical Information Science and Technology Initiative Consortium (BISTIC) Definitions Committee describes this area as one that “applies principles of information sciences and technologies to make the vast, diverse,

and complex life science data more understandable and useful [July 17, 2000].”

As of late 2007, bioinformatics programs in US universities most often appear at the graduate level—graduate certificates and MS and PhD programs. A smaller group of universities do offer undergraduate majors in bioinformatics—the University of Nebraska (Omaha) and the University of Northern Iowa, for example—and some like Stevens Institute of Technology offer a bioinformatics concentration as a track in a BS program (Chemical Biology at Stevens).

The Howard Hughes Summer Internship Program in Bioinformatics offers undergraduates an entry point for research, and the University of California San Diego integrates undergraduate research in bioinformatics into a survey course offered by its Department of Computer Science and Engineering Department. So it would appear that undergraduates are involved in bioinformatics research, but it is still uncommon as a topic. No doubt it will increase as more undergraduates major in bioinformatics, though the passage of another five years development at the BS level will not be too soon to look for a significant change.

Nanoscience would provide a similar outline of activity. Many graduate research efforts and a few undergraduate ones, but significant courses or programs at only a handful of universities—uneven or sporadic activity otherwise. However, there have been and continue to be a fair number of summer REU undergraduate research opportunities in nanoscience, as evidenced by successful programs at Penn State,

South Carolina, Auburn, and several others. The challenge is to make these nanoscience opportunities more widely available.

Undergraduate research in cutting edge areas is building. It is because these

areas are highways to future development that we should encourage our schools, universities and legislatures to support investments in them that engage undergraduates.

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