

NDnano Undergraduate Research Fellowship (NURF) 2014 Project Summary

1. Student name: **Josh Dempsey**
2. Faculty mentor name: Kathleen Eggleston
3. Project title: *Biocomplexity and uncertainty: Science, technology, and ethics in the real-world case of metal nanoparticles in heavy commercial use*
4. Briefly describe any new skills you acquired during your summer research:

My summer's work was based almost entirely in literary research. This being the case, my critical reading and analytical skills were very well-honed this summer. My ability to analyze and synthesize complex articles from peer-reviewed scientific journals was a key to the success of our project this summer,

5. Briefly share a practical application/end use of your research:

The research accomplished this summer will be implemented in science and engineering graduate programs as an efficacious pedagogical tool for instruction in ethics education. We will implement the hypothetical case study developed this summer into a three-hour workshop, with a round of pilot offerings, to be held at the end of the 2014 Fall semester.

Project Summary:

When it comes to the interface between emerging nanotechnologies and society, scientists and engineers are involved in complex ethical dilemmas and the challenge of just decision-making in the face of complexity and uncertainty. The aim of this undergraduate research project is the creative development of materials for the ethics education of graduate-level scientists and engineers on the macro (societal) level. Specifically, a hypothetical case-study has been developed for active learning with role play, a pedagogical approach demonstrated to enhance critical thinking and problem-solving skills in real-world situations.

In the fictional scenario developed, students are given different roles to play as citizens and CEOs alike, and are presented with multiple ethical dilemmas spanning education of the public, risk assessment, precautionary principles, stakeholder theory, life cycle analysis, cost-benefit analysis, occupational health hazards, and stewardship of science. With the developed materials, students will gain a comprehensive understanding of the perspectives informing emerging technologies and societal decision-making, including historical examples such as the inclusion of radium in consumer products before potential health risks and occupational safety hazards had been adequately investigated and considered. Nanosilver is an emerging technology



which parallels the story of radium to a degree. Antimicrobial consumer products containing nanosilver particles can be found online and on shelves at supermarkets, despite the fact that there is limited data on its cytotoxicity and a dearth of literature on its long-term environmental impacts.

Publications (papers/posters/presentations): Poster entitled “Emerging Technologies, Emerging Problems” presented at 2014 Summer Undergraduate Research Symposium.