



At the McCormick Observatory, UVA

Michael Gorman is a Professor in the Department of Engineering and Society where he teaches courses on ethics, invention, psychology of science and communication. He worked for two years as a Program Director in the Science, Technology & Society program at the National Science Foundation and is President of the International Society for Psychology of Science and Technology. His research interests include experimental simulations of science, cognition, and invention and ethics. He is also exploring the kind of interdisciplinary trading zones that will be needed for scientists, engineers and other stakeholders to collaborate on the development of new technologies. His edited volumes include in *Ethical and Environmental Challenges to Engineering* (Prentice-Hall, 2000), *Scientific and Technological Thinking* (Lawrence Erlbaum Associates, 2005), and *Trading Zones and Interactional Expertise: Creating New Kinds of Collaboration* (MIT Press, 2010).

# Societal Dimensions of Nanotechnology Research

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“Empowering students with the capability and desire to engage in interactional expertise and moral imagination.”



### Cognitive-Social Analysis

Gorman is performing a case-study of A. Jean Ayres, a female scientist, therapist and pioneer, using methods and concepts that combine science, technology, and society theories and cognitive science approaches. A. Jean Ayres invented Sensory Integration (SI), a new form of therapy for children experiencing learning and social difficulties because they could not adequately integrate information from multiple sensory modalities. She established a scientific basis for her diagnosis and treatment, using statistical techniques to identify symptoms and neuroscience to determine a cause. A community of practice grew up around SI, and experienced periods of tension and periods of rapprochement with the growing field of Occupational Therapy. This project combined analysis of her thinking processes and the way in which her network of allies grew; the former is usually referred to as cognitive, the latter as social, but in order to understand the development of a new form of expertise, the two have to be combined. We seek to improve on existing techniques for graphing and mapping discovery, invention and innovation that can be applied to new case-studies by other research-resulting in further refinement of the techniques.

### Societal Dimensions of Nanotechnology

Gorman, working with a team of collaborators, has developed a new course on nanotechnology and society that is taught interactively, both to students at the University of Virginia, and to members of a community that are betting on emerging technologies to revive their economy. The course is designed for first and second year students and is offered through the Engineering School, though it is open to students from any major. The course places particular emphasis on developing “interactional expertise” relevant to nanotechnology, which means that students will learn enough about technical aspects at nanoscale to understand its potential social impacts. Unique features include:

- Team-teaching by a social psychologist with expertise in ethics and emerging technology and an electrical engineer who also conducts research on risks, regulation and economic impacts of nanotechnology.
- Connection to students from a community that is trying to create a new workforce educated in nanotechnology.
- Case-studies produced by undergraduate students under the supervision of a prominent ethicist, aimed for publication in journals and conferences.
- An interactive, role-playing simulation in which students work in groups corresponding to laboratories, government agencies, companies and NGOs to shape the future the future of nanotechnology.
- A course assessment component that is led by a leading researcher in the area of evaluation of impacts of curricula on under-represented minorities in engineering.

### RECENT RESEARCH DEVELOPMENTS

- Collaborating with colleagues at IBM and NSF on the way convergent technologies will transform the University. Convergent technologies go beyond MOOCs to consider other nano, bio and cognitive technologies that will transform the learning experience.
- Using the management of our National Parks as a case study of Earth Systems Management, in collaboration with undergraduates.
- Developing new methods for collaborations that link social science, humanities, science and engineering with colleagues (submitted an NSF workshop proposal).

### RECENT GRANTS

- NSF-Societal Dimensions of Nanotechnology: A Course Connecting Communities
- NSF/Scholars Award-A. Jean Ayres and the Development of Sensory Integrative Therapy: A Cognitive-Social Analysis

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