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## STUDENT PERCEPTIONS OF SOCIAL AND ETHICAL ISSUES

Whenever a new technology emerges, examining the social and ethical issues are central to the development of that field. The future applications of nanotechnologies are especially difficult to predict, especially as they converge with other technologies, such as information technology. The use of small sensors and powerful computers could lead to greater personal security and safety, but the same technologies could also be used to spy on people and raise concerns about civil liberties. In a Materials Science and Engineering course in 2006 with a focus on the science and technology of nanostructures, more information was gathered on student perspectives on social and ethical issues in nanotechnology. Thus, it is interesting that when students in a nanotechnology class<sup>1</sup> were asked, "How likely do you think it is that nanotechnology will pose ethical issues in the following areas?" one of their lowest concerns was privacy (with a mean of 2.25)<sup>2</sup>. The lowest concern was in the area of education, with a mean of 1.83. In some ways this response is not surprising, given the context. Students might believe that boundaries should be lax so that the greatest gains can be made. However, with experiments, such as the Milgram study not too far in our past, it would seem that students in the research and science fields would be more cognizant of the risks that "education" could pose to the greater public.

As it stands, little is known about nanotechnology's possible health and environmental implications. From a public perception, nanotechnology is akin to science fiction. On the survey, students were asked if they felt scientists were responsible for considering public opinion when deciding the future direction of his or her research and as a whole, students demonstrated little concern (mean=2.00). When the students are disaggregated, the results demonstrate that student status affects whether the student agrees that scientists should consider public opinion in the direction of their research. While 80 percent of undergrads felt that scientists were quite or very likely to be responsible, only 28.6 percent of graduate students agreed. It is quite possible, that the nature of graduate student work contributes to the difference, but the mechanisms remain unclear. At this critical juncture, it is important that leaders from industry, government, the science and engineering community, and other sectors develop a better understanding of what the public wants and expects in terms of the oversight of these new and emerging technologies. When people are left to speculate about technology, they often draw on analogies to past technologies (i.e. Human Genome project), many of which may be misleading.

Students in this survey may not appear to be concerned with the effects of nanotechnology on the public because they feel that research in this field will be conducted responsibly. On the other hand, students may feel that emerging technologies should not be regulated by the public, but by their peers. Students felt that ethical issues would arise in the development of health (3.08), international (3.08) and military (3.67). These patterns may emerge because of how highly publicized the use of nanotechnology is in military in health.

Regardless of the topic, it is important that as nanotechnology develops, the scientific community remains highly sensitive to all of the social and ethical issues that may arise.

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<sup>1</sup> The survey consisted of 12 students and the results are not generalizable.

<sup>2</sup> The students were asked to respond on the following scale : Not likely, Slightly likely, Moderately likely, Quite likely and Very likely. These answers were then recoded from 0 to 4, respectively.