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Sociology 201
Essay #2
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"It is not enough that you should understand about applied science in order that your work may increase man's blessings. Concern for man himself and his fate must always form the chief interest of all technical endeavors, concern for the great unsolved problems of organization of labor and the distribution of goods."

-Albert Einstein, address at Cal Tech 1931-

Nanotechnology: Modern Technologic Magic or Sociologic and Environmental Hazard

A significant focus of sociological theory and debate is the social conflict that exists between various social castes. In this theory, one sees an unbalanced "social teeter-totter", in which, the wealthy exploit lower class individuals to increase their own profits. From this inequality springs forth social conflict, where change occurs only through means of a social revolution. One could consider the relationship to be parasitic in nature, with little cooperation and almost no mutual benefits. It is through this lens, I analyze the emergence of nanotechnology. In this paper, I will discuss the definition of nanotechnology, the numerous social, health, and environmental benefits proposed, and the hazards that may result as an unforeseen byproduct. Finally, I will argue that although the benefits may be numerous, they will only be available to those that can afford them, and that with this emerging technology, we will see an increase in social inequality.

Initially, nanotechnology is described as "activities that include the manipulation, precision placement, measurement, modeling, or manufacture of sub-100 nanometer scale matter" (Powell 2007). Materials that have been manipulated in this manner have alternative properties when compared to conventional resources. These include increased conductivity, strength, durability, and reactivity. A unique characteristic of nanoparticles is that they display a high surface-to-volume ratio, which allows more atoms to be in a reactive position. Specifically, this is due to the

positioning of valence electrons that can then interact with one another to create distinct reactions (Powell 2007). As a result of the innovative possibilities of nanotechnology, it is no wonder that it is one of the fastest growing industries in today's economy. In 2006, the United States federal government invested $1.3 billion dollars, which was then supplemented by $2 billion dollars contributed by private and state sources (Fitzgerald and Rubin 2010).

Subsequently, the possible innovations that are associated with nanotechnology have considerable health, consumer, and environmental advantages. In the area of medicine, several revolutionary ideas have been projected. These include new drugs, drug delivery mechanisms, non-invasive medical imaging techniques, and ultra hard, light surgical implants (Petersen *et al.* 2007). Some of the most intriguing ideas include microscopic robots engineered to clear plaque from the lining of artery walls and detect illness. At its height, we see the proposition of molecular repair bionics that mend the wear and tear on the body that a person acquires as they age. The promises do not end there; the military has taken a specific interest in this research. Currently, they are testing a battle suit that forms a type of exoskeleton for the soldier's body and is better apt to protect them in battle (Petersen *et al.* 2007). Environmental advances would include an ability to double the efficiency of solar cells and remove contaminants from air and water (Fitzgerald and Rubin 2010). From a consumer perspective, one would see the emergence of more stain resistant clothing, cosmetics, and sunscreens. It seems, that the possibilities of the technology appear to be endless as demonstrated by Fitzgerald and Rubin (2010), when they quoted the *New York Times* article, "[It will be possible to] shrink the entire Library of Congress into a device the size of sugar cube."

Conversely, while these innovations may be true, it is not currently known how they will interact in our biological and social world. As stated by Petersen *et al.* (2007), early innovation is commonly associated with concern over the potential problems that may accompany the good. Health safety of individuals is of top priority. Some toxicologists worry that the increasingly

minuscule size of the particles will allow them to travel across the blood, brain barrier and create new health problems. These issues have the potential to be amplified, as physicians are without the ability to treat afflicted individuals. Furthermore, it has been suggested that just as robots could be created to heal they could be manufactured to harm as well. In terms of the ecological implications, scientists are unsure of how these "nanates" will interact with the environment. Due to their size and mobility, it could be difficult for biologic organisms to address the difficulties that could arise from the particles' presence. Nanates also display an ability to self-replicate, which could pose a variety of problems in the control of their exponential growth (Gould 2005).

Nevertheless, it is evident that nanotechnology will both create momentous opportunities for advancement s as well as potential, devastating effects. The question that comes to mind is which individuals will prosper from highly developed technology and who will bear the weight of the risks. I believe it is written aptly when Fitzgerald and Rubin (2010) state, "Issues raised, primarily by social justice activists, who deal with equity issues [ask] who will have access to the education and training required to work with these advanced technologies? Will uneven economic development reinforce demographic and regional inequalities?" It is apparent that the mechanic down the street will not have the education in order to run these bionic devices. In addition, we would see technological innovation may begin to replace human labor. This would result in greater corporate profitability at the expense of the worker. Similarly, it is the common worker, not the manager or CEO, that would work in the fabrication plants and who would be exposed to the health risks (Gould 2005). One of the many benefits of nanotechnology, is that it would allow us to produce consumer items in surplus; however, according to Gould (2005), it has been shown that increased material abundance has been associated with dramatic increases in social inequality. Finally, it is essential to consider the individuals that would be able to afford the burgeoning treatments in health care, as well as the other benefits. Scientists propose that with nanotechnology, they will have the ability to filter water to the point where the global fresh water

dilemma will be solved. The question then becomes, will the mid or lower class individual be able to afford this water?

In conclusion, I find that nanotechnology presents an opportunity for the world to solve many of its current problems; however, the social, ethical, and biologic problems that may accompany it must first be addressed. The issue that we must primarily consider is, now that we have the ability to clear plaque from an individual's arteries how are we going to allow everyone access. We must not see the benefits be allocated to only the corporate owners and investors, but the lower class father that works a common blue-collar job. In addition, we must insure, that his job remain available, not distributed to an advanced cyborg, and that working conditions are safe. Gould (2005) writes, "It is more realistic to expect [that] innovation will serve the interests of those who control the process and result in greater inequality." It is this statement, I believe we must avoid at all costs. Before we partake of the fruits of our labors, we must first consider the potential for disaster. As Albert Einstein stated, "Order that the creations of our mind shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations."

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