Class 3. Introduction to Nanotechnology and Society

Reading:

- *Understanding Nanotechnology*: "Forward", "Introduction" and "Little Big Science" (up to page 17).
- Trevor and Pinch, "Introduction: the technological golem"

Turn in:

- Nothing, but come ready to discuss what you read, and <u>always bring your readings with you.</u>

1. Re-Intro for new people. Philosophy of class. Reminder to buy course reader. Office hours after class in Social Sciences 6321. Website.
2. Spillover: Science vs. Technology definitions and prediction. Review of last class and return of graded homework. Discussion of predicting science vs. technology.

3. Discussion of survey results.

    a. People prefer groups without the projects, don't want the grading confusion or having to meet outside of class. OK.
    b. Personal responsibility and equality question – Good group, cool subject, won't be a problem. Make up groups randomly (names in a hat).

4. First essay assignment on *Defining Nanotechnology*. Preview of what we'll be doing this week: looking at some good reviews.

5. Groups review UN article, report back.

    a. What do scientists mean when they say mesoscale? What is Roco's definition of nanotechnology? What disciplines make up nanotech?
    b. List all the nanotechnologies you find.

6. Lead discussion: Beginning to define nanotechnology.

    a. Defined differently by different people.
    b. Defined by society before defined by science.
    c. M. Roco's definition. He administers the NNI, directs funding.
        i. Nanotechnology: (from UN) The emerging field – new vs. old nanotech – deals with materials and systems having these key properties: they have at least one dimension of about one to 100 nanometers, they are designed through processes that exhibit fundamental control over the physical and chemical attributes of molecular-scale

structures, and they can be combined to form larger structures.
ii. Used to limit the scope of the word and field

d. Nanotech is a subset of Condensed Matter physics, says the CM physicists
e. CM (solid state): biggest field (plasma, high energy, nuclear, atomic)
    1. CM Physics: study of matter that is condensed: solid, liquids : crystal, metal, semiconductors, emergent phenomena in many atom systems
    2. mesoscale: molecules – microns where new properties, usually quantum emerge.
    3. Physicists def. of nanotech:
        a. Quantum-size effects that emerge at the nanoscale
        b. Area vs. Volume ratio.

7. The Golem: the science Golem vs. the technological Golem.
    a. What's a Golem?
    b. Is technology a Golem?
    c. What is different between science and technology? Where is each practiced?
        i. Tech is demonstrated and used in conditions which are under less control than is found in scientific labs.
        ii. How is the reliability of technology different from that of science? Can one fail without the other?

Reading:

- *M. C. Roco, Broader Societal Issues of Nanotechnology*, Journal of Nanoparticle Research, 5 (2003): 181-189 (No. 15 in the reader).
- *Swiss Re report on Nanotechnology*: Small matter, many unknowns
    1. *Ch. 1&2: Charlie*
    2. *Ch. 3.1-3.3: Group A*
    3. *Ch. 3.4-3.5: Group B*
    4. *Ch. 4: Group C*
    5. *Ch. 5: Group D*
    6. *Ch. 6: Group E*
    7. *Ch. 7: Group F*
- *Optional*: Ratner and Ratner, Ch. 3: Fundamental Science Behind Nanotechnology (No. 3 in the reader)

Turn in:

- Outline of your assigned chapter in the Swiss Re report.