CPSS 100 & 101 – Science, Technology and Society (STS) Freshmen Colloquium

In general, the two semester course is built around understanding social, political, cultural, and ethical issues related to emerging technologies and sciences (e.g., nanotechnology, robotics, synthetic biology, ICTs, cognitive sciences, alternative energies, geo-engineering). However, since emerging technosciences clearly will have impacts on how we envision and seek to build sustainable societies and perhaps unintentionally become countervailing forces in realizing a sustainable future, the CPSS freshmen colloquiums are a natural place to interject this subject in a variety of places.

One phenomena that we explore in STS is why some technologies are more "successful" than others. It is commonly thought that the technologies available to us were the best technologies available at the time of introduction; or that the technologies that we have today are part of a "natural" progression that embodies increased productivity, efficiency, and/or convenience. However, the STS framework challenges these assumptions. In Spring 2015, I will revise my unit on alternative energies to more deeply explore why some technologies thrive and others fail, despite evidence that some might be more sustainable than those adopted. The unit will explore two basic questions in relation to renewable and non-renewable resources, systems thinking, and governance:

1) Why do certain technologies persist even if we know they are inefficient and full of external environmental and social costs?
2) Even if alternative energies do experience wide adoption, why don't the most "optimal" always get adopted?

Question 1 (February 23): Once a technology (e.g., fossil fuels) gains a foothold in society, its presence can create a great deal social, economic and cognitive momentum (technological momentum). As a consequence, a sort of tunnel vision results, with future technological advances and human social behavior organizing around the "founding" technology. Because of all the social and technical infrastructure already invested in the "founding" technology, it becomes "inevitable" that future technologies and social behaviors will organize and be justified on the basis of this founding technology. For example with fossil fuels, even just on the exploratory front, immense amounts of social, political, and cultural capital has gone toward developing new technologies (offshore drilling, fracking, methane hydrate) to find fossil fuels that will feed the social (e.g., individualism and gasoline cars) and technical (gasoline engines, highway systems) infrastructure that has built up around the fossil fuel energy system. As time passes, it gets increasingly difficult to disrupt such a socio-technical system with alternative technologies. So in the end, the problem of introducing alternative sustainable energies is not solely about replacing fossil fuels with more sustainable technologies, but replacing (or integrating with) an existing complex system highly embedded in our social fabric.

Question 2 (March 2 & 9): This question will be explored through concepts derived from Actor Network Theory (ANT). It is as an analytical tool for understanding the political dynamics of the emergence, stabilization, and destabilization of networks or alliances formed to carry out a specific technoscientific goal. This framework generally analyzes a problem from the perspective of scientists and engineers (and/or the institutions they work with - e.g., alternative energy developers) that compete for human (engineers, scientists, politicians, consumers, bureaucrats, etc.) and nonhuman (corn, sugar, lab equipment, infrastructure, etc.) resources to build a network that will accept/use their scientific or technological product. So the process is partly driven by social actors, but is also driven by nonhuman actors that include technological artifacts, organisms, and the non-living environment. Network

formation is seen as a political act in the sense that central actors are trying to push *interests* (e.g., solving an environmental problem, proposing an alternative energy) through a series of *translations* to convince other actors that their product is what they need. This process, for example, can be seen in the recent adoption of corn ethanol as the primary biofuel additive (E10, E85) in gasoline, despite evidence that sugar ethanol and other alternatives would have been a more sustainable choice (e.g., more reduction in carbon emissions). In essence, the corn ethanol industry was far better at forming alliances with the car industry, petroleum industry, farmers, local and state governments, environmentalists, advocacy groups, and the Congress than other producers of biofuels, allowing them to eventually dominate the market when the opportunity emerged. ANT also explores the unintended consequences of adopting new technologies such as using corn ethanol as a fuel additive. For instance, we could look at the extended consequences of displacing land use as a source of food with the production of biofuel.

Learning Objectives:

1) Explore the current social and technical constraints associated with relying on non-renewable energy sources that slow or hinder the adoption of emerging renewable energy technologies (Question 1)
2) Use systems thinking to aid our understanding of the socio-political and technical challenges associated with developing sustainable alternative energies, including the unintended consequences of adopting new alternative energies. (Question 2)
3) Employ the STS analytical tools of technological momentum and actor network theory to dissect current energy policies and imagine more effective and politically equitable governance strategies that foster private, public, and civic sector partnerships that can overcome the barriers to adopting more sustainable energy production systems (Questions 1 and 2)

Assessment: Each of the main questions above will be prefaced with a brief, 15-20 minute lecture (on separate days) that introduces the topic and the specific STS analytical tool being used to explore that topic. Each lecture will have a brief example that illustrates how STS concepts helps aid our understanding of the basic question being asked. After each lecture, a short 5-10 minute discussion will ensue to assess basic understanding of the concepts and topic. The bulk of student assessment will come through group work (3-4 people) designed to illicit a deeper exploration of the two questions. For each question, students will be required to turn in a document to me so I can assess their ability to employ STS tools to understand each question.

Question 1 (Objective 1) Group Work: Each group will be asked to identify a technology that is either directly or indirectly related to the fossil fuel energy system and map out as many social, cultural, political, economic, environmental, and technical connections associated with that technology as possible. From there, the group will have to identify in what ways, if any, these connections amplify technological momentum, create barriers to alternative energies, and/or provide opportunities for intervention with alternative energy technologies.

Question 2 (Objective 2 and 3) Group Work: Each group will identify an alternative energy technology and take on the role of its developer and advocate. From there, they will be asked to imagine what actors (both human and nonhuman) they will have to form alliances with in order to make the alternative energy viable. The group will also be tasked with thinking about the potential unintended consequences of adopting this new energy system. (This assignment will require students to do research and will take place over several class periods).