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History and Philosophy

[[This paper was not meant to be read. It shouldn't be cited.]]

Dave asked me to talk about when, how, and where to teach ethics to students. I will focus on that question, but also on one of the BIG QUESTIONS that I think we have missed in our discussions – social justice – though it has appeared here and there. I fear this talk has transformed into a defense of humanism, but I don't really want it to be. I do want it to be a little provocative.

History of science and philosophy of science are broad and different fields. Both deal with the relationship between science and society, between nature and culture. Both start from a similar foundation, that there is no science divorced from values. The idea that science is somehow constrained by non-scientific forces, be it religion or ideology, or that science is directed by non-scientific forces, such as military aims or economic forces, is not a constructive idea. We are not talking about science constrained or science directed or science shaped; we are just talking about science. Or, to put it another way, there is no good science or bad science; there is only science, which then fits into these broader forces that we determine as a culture are positive or negative, good or bad, ethical or unethical.

Philosophy of science deals more broadly with ethical considerations, with the introduction of bias into science, with questions of methodology. Kristen Intemann, a philosopher of science at MSU, shows how bias is introduced early into the process, at the point of asking the initial questions, formulating the initial hypotheses, writing the initial grant. She teaches our Research Ethics course, required for all students who are funded by NSF grants. (Incorporating minorities into projects is a significant component to most grants. Montana's largest minority is Native Americans. Usually this is a one-way collaboration which entails MSU researchers coming up with the questions, let's say water quality, then, last minute, bringing in Native American issues and researchers, or perhaps just going to the actual space of the Reservation. That is a problem.)

Historians are more interested in questions of social structures and power relations, the role of cultural forces. Dinosaur Wars, for instance, has to do with all the forces that are associated with intense knowledge creation. Reminds me of the first Dinosaur Wars between Marsh and Cope. It has to do with boundary making: who can and can not create scientific knowledge. It has to do with private vs public knowledge, not just private and public lands; where does the expert lie. Has to do with where the money goes. Most science sustains the status quo. When it doesn't, it usually doesn't survive.

So let's talk about specialization and a defense of disciplinary knowledge. The best place to start is with the Prussian explorer Alexander von Humboldt. The water level was falling in a lake in South America. The accepted theory was that there was a hole somewhere where the water was sucked to the sea. Humboldt said it had to do with trade patterns of large empires in Europe and their source of transportation – wooden vessels -- leading to deforestation, and on and on until you get changes in the level of the lake. All of this in 1799. He was a truly a pioneering holistic thinker.

Perhaps his most important scientific publication was his "Essay on the geography of Plants," the seminal publication for the science of biogeography (where plants grow and why}. Humboldt linked the study of biogeography directly to human agency, to wars and passions and the human diaspora throughout the globe. Whereas winds, currents, and birds could "aid the migration of plants," it was "man [that] primarily takes care of this."

> These are some of the considerations agriculture presents, and its various produce depends on the latitude, origin, and needs of people. The influence of food, more or less stimulating the character and energy of passions, naval history, and wars undertaken for the dispute of produce of the vegetable kingdom; these all link the Geography of Plants to the political and moral history of man.

Humboldt always incorporated humans into his science; he cared first and foremost about social justice issues. Out of his thirty volumes published from his trip to

Central and South America, Cuba, and Philadelphia, we read only his *Personal Narrative*. We miss the rest of his work, which is about slavery and other social justice issues.

We talked earlier about an integrated, systems approach to knowledge, and that this was first encountered in biology and ecology. I would argue the opposite. Darwin's hero was Humboldt. But Darwin took social justice issues out of science, and as biology specialized, it moved further and further away from these issues. In Huxley's seminal *Evolution and Ethics*, science and ethics are completely and utterly divorced. This is part of the history of what leads to what C. P. Snow calls the problem of the "two cultures," which creates a system of teaching based on a "gulf of mutual incomprehensibility." Snow hit on a real problem.

An example is the" trophic cascade," which in these parts is exemplified by the extermination of wolves, leading to more elk, leading to de-vegetation of riparian environments, leading to muddy rivers, leading to loss of oxygen in water, less fish, more flies. The cascade from wolves to flies is fascinating and well understood. What isn't understood is the more complex problem of when the science hits the broader culture. That's where the problems arise. The question of wolf reintroduction is a question of agricultural interests, tourism, biodiversity, cultural attitudes toward wilderness, local, state, and federal laws and interests, and on and on. The point is that wolf reintroduction is no longer a scientific problem; they are a question of culture, where a diverse, complex array of forces are at work. We need to think not in terms of trophic cascades, but socio-trophic cascades. (Or when we use terms like "indicator species" which supposedly indicates the health of an ecosystem: We need to look at what exactly it is "indicating," which turns out to be much more interesting.)

So, how do we do that? What does that look like? Can't go back to Humboldt. We live in a world of disciplines and we should celebrate that.

Congressional language for the funding of basic research at NSF and other federal science agencies has underscored the importance of assessing the social and

ethical implications of science and technology. Congressional concern followed from the contentious issues surrounding recombinant DNA in the 1970s, the alarm raised by the Human Genome Project at the end of the 1980s, and the debates over using GMOs today. What this language did not do was define what social and ethical implications of science and technology meant, and how to implement it throughout the research process, including the training of graduate students who represent the next generation of grant writing scientists and engineers.

In undergraduate education, this is fairly well-advanced. Science, Technology, and Society (STS) degree programs have spread at the undergraduate level. We have implemented a Science, Environment, Technology, and Society (SETS) major, a broad multi-disciplinary program of research and teaching that includes the disciplines of history, philosophy, and religious studies, along with allied fields in the social, biological and physical sciences. It contains an "A to Z" approach, following the lifecycle of advances in science and technology from their birth in the laboratory or field to their maturation as they are introduced and integrated into broader culture. Starts with the social and ends with the social.

Climate change is no longer a question of science. It is a question of social justice. It has to do with race, class, and gender. Most affected by climate change will be underrepresented, un-empowered, poor women in poor countries. This is inversely proportional to who is working on the question. The same can be said about fracking, mining, and other issues. These issues are questions of social class and power. Must have a social justice element first and foremost in mind when discussing questions of geoethics, the main basis of any ethics in geosciences. Humanists are trained to answer questions of social class and power. In fact, in the model of STS, both humanists and scientists are need to be involved.

Take the Safe Drinking Water Act and subsequent regulations, which set politically negotiated, scientifically acceptable, and historically pioneering standards for levels of contaminants found in finished drinking water. Anne Camper and others at Montana State have worked on the scientific side of this topic. Environmental protection initiatives actually led to many of the problems. In 1993,

after the United States phased out the use of leaded gasoline, the additive MTBE became the second most manufactured organic chemical in the United States (at 24 billion pounds that year). That is, federal lawmakers demanded its creation through legislation, and therefore facilitated its occurrence in the environment, including in Montana, where it has become a major health threat in drinking water. Not surprisingly, Montana's tribal communities have particularly high rates of exposure to contaminants. This is a question of environmental racism.

Historians are trained to identify and explain the political and social forces that led to MTBE being introduced into national ecosystems, and the resulting environmental racism, while scientists are trained to identify and explain the manner in which chemicals flow via underground hydrologic cycles.

That is, drinking water pollution is caused by hybrid forces – both anthropogenic and naturally occurring – and both of the two culteres are required. Not done well at the graduate level. Perhaps we must implement STS certificate programs at the graduate level. We need a broad education at the graduate level, training from a hybrid approach of scientists and humanists, to look at questions that are hybrid in nature.