Where do philosophers fit in sustainability science?

1. Introduction

"Sustainability science is a field defined by the problems it addresses rather than the disciplines it employs" (Clark 2007, 1737). In many cases, the problems resist clear cut formulations and do not privilege one disciplinary approach to tackling them (Norton 2005; Batie 2008). These points lead to today's discussions on how different engineering, natural science, social science, and humanities disciplines can cooperate and how academic approaches can interface with policymakers, stakeholders, and publics. The least developed area in these discussions concerns the role of the humanities disciplines. We will outline one way in which philosophers in particular can contribute to sustainability science projects. Our goals are to build awareness of philosophical contributions among scientists and engineers and to create more opportunities for philosophers to reflect on this issue.

2. Philosophers and Scientific Collaboration in General

Philosophers are sometimes not acknowledged for their contributions to multidisciplinary science projects. In cognitive science, some of the best philosophers of the 20th century engaged in extended interaction with neuroscientists, computer scientists, evolutionary biologists and psychologists. Together, they jointly produced an entirely new paradigm for the study of intelligent action and behavior. The role that philosophers played has been described by Daniel Dennett as one of formulating better questions (Dennett 2009) and by Paul Thagard as of clarifying numerous general and normative issues (Thagard 2009).

For example, Dennett argues that cognitive science initially had difficulty getting off the ground due to lingering biases that accrued in an era when behaviorism foreswore all talk of minds, beliefs or intentions. Philosophers were able to articulate ways of interpreting these key

terms that were sufficiently well defined and operationalizable so that neuro-scientists and psychologists were able to undertake empirical studies (Dennett 2009). Thagard describes how methodological disputes in cognitive science often involve scientists who are not aware of what assumptions underwrite their ideas. Philosophers' knowledge of the different ways of understanding cognitive theories, explanations, and the differences between explanation and prediction can play an important role. Philosophers can make cognitive scientists' assumptions explicit, expose paradoxes and problematic implications, and construct arguments for some of the logical advantages of some methods against others and for how to adjudicate competing claims that are grounded by the same methods (Thagard 2009).

The skills that lie behind the roles described by Thagard and Dennett are developed through philosophical training in the identification of implicit assumptions and the critique of argumentation. The knowledge base consists in the centuries of philosophical texts, study of which can reveal the way that patterns of reasoning produce both solutions to a general class of problems, but also end in paradox, anomaly and confusion. Philosophers of science, biomedical ethicists, feminist philosophers, and phenomenologists have played this role in collaborative projects with scientists.

3. A Philosophical Contribution to Sustainability Science

In terms of collaborations with scientists on sustainability problems, philosophers can contribute to the ways in which particular disciplines ask questions, formulate assumptions, and examine normative issues. Examples like cognitive science give us an idea of how this would be done. Yet there are other ways in which philosophy may be able to play an important role that is relevant to some of the future directions of sustainability science.

Now recognized as an official section within the National Academy of Science, sustainability science reflects the convergence of three distinct trends. First, it has been long recognized that many key scientific breakthroughs either require the coordination of scientists working in multiple disciplines, or occur at the intersection of disciplines (Watson 1968). Second, scientific inquiry structured so as to produce discoveries and results relevant to practical problem solving requires a somewhat different organization and orientation than curiosity driven science. In particular, conceptualizations of why a circumstance is taken to be problematic interpenetrate with theory and models from biology and environmental science, and are essential to the stopping rule that indicates when a significant scientific result has been achieved (Giere 1999). Finally, problems in sustainability are increasingly seen as "wicked", meaning that they involve high degrees of uncertainty, a poorly articulated problem statement, low levels of agreement about what would count as improvement and high stakes for being wrong (Rittel and Webber 1974).

Sustainability science draws upon the committee process that evolved over many decades to produce definitive state-of-the-science reports by various national or royal academies of science. This approach lay behind the formation of the Inter-governmental Panel on Climate Change, which assembled large teams of scientists from around the world in an open-ended discussion and debate process to identify those areas on which consensus could be reached. It has been suggested that many of the complex interdisciplinary wicked problem areas can benefit from a similar approach (Liu et al. 2007). Although philosophers are occasionally included in such interdisciplinary teams, our argument here emphasizes the way that their role might be expanded in the future, especially in terms of how problems are approached.

Philosophical texts of both ancient and recent origins can be used to develop the outlines of general mentalities that might include tacit assumptions about the nature of rationality and decision making or the source and role of values or value judgments in conceptualizing a problem. These outlines of mentalities or worldviews can then be treated as ideal types. That is, "the consequentialist" comes to be understood as someone who approaches decision making in a structured way, considering each option in light of the benefits and costs that selecting the option will produce. "The anthropocentrist" evaluates outcomes solely in light of benefits or costs to human beings. The "ecocentrist" presumes that the fate of nonhumans or even ecosystem processes has standing in the weighting process. Clearly, the list of ideal types that can be generated in this way is indefinitely long, and equally clearly they are caricatures of the positions that philosophers have actually argued. Nevertheless, these ideal types have the potential to play a variety of roles in responding to complex problems.

First, ideal mental types can be used to characterize the perspective or orientation of various actors in the problematic situation. When this exercise is undertaken within the context of a conflict situation, it can help contestants depersonalize the conflict and realize that their opponents are arguing from principled positions, even if those positions are ones with which a given contestant continues to disagree. To the extent that participants in conflict are able to do this, they are more able to engage in conversational give and take with an eye toward either persuading their opponents, or alternatively making concessions or compromises that address their genuine concerns (Varner et al. 1996). We do not suggest that conducting a mediation is itself a task for philosophers, only that they help provide the tools to do so.

Second, ideal mental types can help people appreciate the fact that they themselves hold assumptions that are not universally shared. Scientists studying the relative welfare of animals in

different environments have struggled over the way in which welfare is conceptualized. Fairly recently, collaborative work among philosophers and ethologists has begun to diagnose an important source of their conundrums. While most North American ethologists have tacitly assumed that the ability to perform species typical behavior was of significance to welfare only insofar as frustration of the ability redounds in cognitive stress or impairment of physiological functioning, many European scientists have presumed that these behaviors are in fact constitutive of welfare. The latter assumption effectively makes living under conditions approximating those in which species evolved into a precondition for good welfare (Appleby and Sandøe 2002; Fraser 2008). It also makes any strategy to address the welfare of animals through breeding or biotechnology inherently problematic (Gamborg and Sandoe 2002; Thompson 2010)

Finally ideal mental types can stimulate a reflection on one's own assumptions, and this reflection can, in turn, open the door to more creative thinking. One of us (Thompson) has contributed analyses of the controversy over genetic-engineering in agriculture in which two stylized portrayals of risk management are contrasted. One builds upon utilitarian thinking to stress optimizing expected values, while the other generalizes from research ethics to stress informed consent (Thompson 1996, 1997, 2002). As the tensions between these models came to be more widely appreciated, many participants in the debate (including regulatory agencies) over so-called GMOs began to develop substantially more nuanced approaches, eventually negotiating voluntary labeling arrangements for cloned animals after having discouraged any form of labeling for the first generation of genetically engineered crops.

3. Interactive Ability and Jargons

Analysis of ideal mental types alongside other disciplines requires that philosophers see themselves as one approach among many collaborating approaches. Philosophers are not so

much exploring foundations or assumptions of scientific practices; rather, philosophers are contributing content by using their preferred methods for arriving at ideal mental types in ways that are relevant to what the other collaborators are doing. Philosophers must *both* contribute content and understand how their contributions need to be tailored to fit in relation to the other disciplines.

One of our ideas is that philosophers often develop an *interactive ability* in specific sciences. In addition to our experiences, we draw some of what we mean by this term from the work of sociologists of science. Harry Collins and Robert Evans describe various kinds of experience and expertise that someone can have in a science. Someone truly becomes a full-blown expert, or "contributory expert," when he or she can do work that makes a normal advancement or impact in the particular science. The major component of contributory expertise is tacit knowledge (Collins and Evans 2007).

Yet the tacit knowledges of experts makes it difficult to communicate across sciences. While immersed in his ethnographic field work at the Laser Interferometer Gravitational-Wave Observatory (LIGO), Collins found that both himself and the project managers contributed little or nothing to various contributory tasks such as math, building experiments and co-authoring papers, but were nonetheless able to talk fluently with the different contributory experts. In the case of project managers, they were able to direct interdisciplinary research without having contributory expertise in most of the disciplines involved. Collins and Evans have described this phenomenon as *interactional expertise*. It is the ability to talk fluently in the idiom of an expertise without being able to be a contributor. Moreover, someone with interactional expertise could pass a Turing Test of whether he or she is a scientist in a discipline that is judged by

contributory experts. Interactional expertise, however, is not gained quickly, but requires experience similar to what it takes to learn a new language.

In our experiences, we have found that some philosophers have developed interactional expertise through immersion over many years, but perhaps a larger number who work successfully on collaborative grants have developed a lesser expertise, interactive ability. Interactive ability is gained through what we might call sustained involvement (and not immersion) with scientists in a particular discipline *or* with groups of scientists of different disciplines. Philosophers with interactive ability have a respect for the narratives and histories in which scientists are embedded, a sensitivity to the various hoops, conventions, role plays, power dynamics, etc. in that science or in the interdisciplinary collaboration. In addition, philosophers would have an understanding of the trajectory of that science or collaborative situation and the discernment to recognize the future of research specifically on ethics, values, social dimensions, or other philosophical topics in which he or she specializes.

Another idea we have stems from the work of Peter Galison and, later on, Michael Gorman, on the languages used to facilitate interdisciplinary collaboration. Galison first used the notion of *trading zone* to explain how scientists and engineers from different disciplines can collaborate. Studying particle accelerators, he found that experts of different types who have to work together would develop first "jargons," then "pidgins," and, finally, full-blown "creoles." These languages enable communication even when the ultimate meanings of the words are understood by each practitioner from rather different personal, professional, cultural, and institutional experiences. "They can come to a consensus about the procedure of exchange, about the mechanisms to determine when goods are 'equal' to one another. They can even both

understand that the continuation of the exchange is a prerequisite to the survival of the larger community of which they are a part" (Galison 1997, 803).

A jargon might be described as the most basic set of linguistic conventions that facilitate common communication in this sense. A pidgin would be more systematic. A creole emerges when people are actually trained to speak it. Like with interactional ability, though there are some philosophers who may share fluency in a creole with scientists, it is likely that far more are able to collaborate successfully by having a jargon among a group of scientists. Importantly, to do so requires that philosophers consider themselves as in a community with scientists, not as external critics, guests, or in some other role. What is required then is a realization that there are communities that involve philosophers in the same way that there are communities of scientists and engineers. At MSU, for example, the Center for the Study of Standards and Society serves as such a community where, in particular, philosophers, social scientists, engineers and natural scientists have developed what might count as a pidgin that facilitates work on numerous grant projects.

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