

Cross-Disciplinary Research and the Practice of Epistemology

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Introduction

Many pressing, complex problems require research that spans multiple disciplines. Cross-disciplinary research (CDR) of this sort is an increasingly important part of the contemporary scientific landscape, commanding the attention of research centers and funding agencies alike. CDR supplies a context in which many vexing epistemological questions arise, e.g., how are research conclusions to be assessed when participating disciplines employ different methodologies and standards of confirmation? While scientists participating in these efforts have grappled with these questions (e.g., Benda et al. 2002, Campbell 2005, Stokols et al. 2008), few philosophers have turned their attention to the epistemological challenges of CDR.

In this paper, we have two objectives. First, we argue that close attention to the epistemological and social dynamics of CDR can put old philosophical problems into a new light. While we believe that many traditional epistemological problems could be helpfully reconceived in the context of CDR, we focus on the problem of *reasonable disagreement*. In particular, we argue that the messier and more realistic epistemic context afforded by CDR illuminates important facts about both the relationship between a conclusion and its evidence and the rationality of disagreement. Second, we argue that in addition to clarifying its conceptual character, philosophical epistemology can be applied to enhance the day-to-day operation of CDR. Developing and extending the “Toolbox Approach” described in Eigenbrode et al. (2007), we champion the value of epistemological intervention as a way of enhancing the efficiency and effectiveness of cross-disciplinary research. In sum, then, we argue that CDR can provide a context for enhancing epistemology, and epistemology can provide a context for enhancing CDR.

The Nature of Cross-Disciplinary Research

Consider the following examples:

1. In 1999, the National Institutes of Health and the Robert Wood Johnson Foundation created several Transdisciplinary Tobacco Use Research Centers that focus on bringing together researchers from many disciplines to investigate the scientific, political, and health-related aspects of tobacco use (Stokols et al. 2003).
2. One of the authors (O’Rourke) participates in an on-going project that aims to design and deploy a fleet of collaborating autonomous underwater vehicles (<http://www.mrc.uidaho.edu/cisr/subs/index.htm>). O’Rourke’s contribution to this project, dominated largely by mechanical and electrical engineers, has been to apply his expertise in the conceptual aspects of natural language semantics and pragmatics to develop agent communication language protocols and associated logics for information transfer and interpretation. (See Bean et al. 2008.)
3. Requested by local citizens, a group of university researchers collaborate with the USGS to generate an area water quality survey. This survey includes sections written by hydrologists, limnologists, soil scientists, and biologists, collected together into a single report.
4. Preparing an article on the binding problem in the philosophy of mind, a philosopher devotes many hours to studying neuroscientific reports of parietal lobe activity.

These research efforts are *cross-disciplinary* because they combine information and insight from different disciplines. A fully adequate characterization of CDR would require systematic description of its multidimensional variability, but that isn't our quarry in this essay. We settle for an informative gesture in its direction.

CDR is research conducted across disciplines. Thus, we focus on cross-disciplinary *research*, as distinct from cross-disciplinary practice. As research and practice bleed into one another, this is often a difficult distinction to make, but once again a focus on paradigmatic cases of CDR should suffice. In addition, we must clarify what we mean by 'discipline' so that it is clear what it means to cross one. For our purposes in this essay, we will take a discipline to be an internally constituted set of practices that is sufficiently widespread and stable to have received institutional support. With this fixed, we will proceed to define 'cross-disciplinary research' as research involving the participation of more than one discipline.

In sum, a process of inquiry that generates knowledge as output can take as input form (e.g., methods, confirmation standards) or content (e.g., information) from different disciplines; when it does, the process is *cross-disciplinary*. On this account, CDR may not require significant integration or collaboration. Thus, it includes large collaborations, such as example 1, and individual efforts such as example 4. CDR does not discriminate as a category between multidisciplinary, interdisciplinary, pluridisciplinary, or transdisciplinary research. Given this, it comprises loosely integrated research efforts, such as example 3, and more significantly integrated efforts, such as example 2.

Reasonable Disagreement—Action in Philosophy

The purpose of this section is to defend the claim that study of CDR can inform Standard Analytic Epistemology (SAE), the brand of epistemology practiced by analytic philosophers in the Anglo-American tradition. We offer an argument by example. The piece of SAE we choose to consider is the current work on reasonable disagreement.

Reasonable Disagreement—Current Version: The heart of the reasonable disagreement puzzle can be found in Richard Feldman's (Feldman 2003 pp.182-188) story about two doctors; J and K both of whom are seeking the cure for some disease. J runs study one which yields the result that X is the cure. K runs study two which yields the result that Y is the cure. Each has good reason to think they have carried out their inquiry appropriately. So far so good says Feldman—it is certainly possible for distinct agents to use reasonable methods and get different answers to the same question. But what if both J and K came to be aware of the others work but continued to believe their answer was correct. Once again—no problem; both J and K may have reason to think the other has made some sort of mistake. But what of the tolerant outcome—that is;

J (K) justifiably believes that X (Y) is the cure. AND
J (K) justifiably believes that K (J) justifiably believes that Y (X) is the cure.

That is, J has good reason to think that, based on evidence shared with K, he/she has found the cure *and* that K has found the cure. Bearing in mind that their respective "discoveries" are incompatible, J appears to have a justified belief that P (i.e. X is the cure) and—since if Y is the

cure then X is not—that $\sim P$. Thus J possesses inconsistent beliefs. Far from being desirable, epistemic tolerance is incoherent. Feldman seems right to claim that the only epistemically rational course for J and K is to withhold judgment regarding whether X or Y is the cure they seek. But what if we enrich his example in a way brought to our attention by thinking about CDR?

Adding a CDR Perspective: Feldman's story concerning J and K is silent on the nature of J's study one and K's study two. Once you have been immersed in the world of CDR, that silence seems strange indeed. This is because some of the difficulties inherent in CDR are due to differing tacit assumptions about the process of doing science—an epistemically potent issue if ever there was one. Resolving this sort of difference in methodological presuppositions is a crucial component of successful CDR. We'll try and make this salient by re-imagining Feldman's medical research example.

To make things more concrete, let's give a name to the disease that J and K are studying. Imagine they are working on sickle cell anemia in central Africa. Further, assume that J is a hematologist and K an epidemiologist. J discovers that CSA arises as a result of mutant hemoglobin and as a result argues that the cure for the disease is regular hemoglobin transfusions. K discovers that CSA co-occurs with malaria and advocates public health measures to eliminate mosquito populations as the cure for the disease. If J and K are going to make a joint report to the NIH on how to deal with CSA they must work out how to reconcile their research. They do well in this task if they begin by coming to understand the perspective of the other. Once that has been achieved they are in a position to rationally integrate their perspectives.

In our view, the right way to think about what J and K are doing with their joint research on CSA is to identify two stages. In the first they come to appreciate their differences, in the second they negotiate a resolution to those differences. We think that this second stage—which we call epistemic compromise—is an important new aspect of epistemology that is revealed by the study of CDR. However that is a story for another day—for now we want to focus on the first stage of this process. We do so because we take the key feature of this first stage to be the achievement of *reasonable disagreement*. That is, J and K must come to appreciate that the evidence does indeed support *both* interpretations.

Since the story we have just told is one that we think is right and is one that conflicts with Feldman's account, we must now offer a perspective that both explains our point of view and accounts for the limitations of Feldman's.

Back to SAE: Our central claim is that specifying the epistemic features of an inquiry other than the method to be used does not settle the issue of which method ought be used. Even if you and I are trying to answer the same question in the same context and with the same evidence, we may legitimately differ on the appropriate method for extracting answers from the evidence. This is a direct consequence of our limitations as inquirers. Given this multiplicity of methods, we must re-imagine what is involved in the notion of justified belief. We can no longer claim that for a belief to be justified it must be warranted by *the* appropriate method; rather we are limited to the claim that it is warranted by *some* appropriate method.

Once we adopt this new account of justification we can see that there is nothing inconsistent with reasonable disagreement. Consider, for example:

- 1) J believes justifiably (method M1) that evidence (E) supports conclusion C1.
- 2) K believes justifiably (method M2) that evidence (E) supports conclusion C2.
- 3) C1 and C2 are incompatible.

These are compatible with J believing justifiably (method M1) that K's belief that E supports the claim that C2 is justified.

How does this fit with Feldman's analysis? To keep things simple we'll assume that the epistemically relevant material is exhausted by fixing evidence, context, question, and method (ECQM) and that epistemic determinism is correct. So, if we fix ECQM, we fix what is justified. Now assume that fixing ECQ fixes M. Then it follows that two agents pursuing an answer to the same question in the same context and with the same evidence must end up with the same justified beliefs. Although Feldman does not say so, his examples strongly suggest 1) that agents attempting to disagree reasonably share ECQ and 2) that ECQ fix M. 1) is suggested by his analysis of the J and K case. 2) is suggested by his analysis of the good/bad teacher case (p. 179). Thus what is wrong with Feldman's analysis according to us is that he misses the possibility of multiple reasonable methods of inquiry given fixed ECQ.

Note—in all of this we are not saying that Feldman is never right. Rather we hold that he is not always right. There exist epistemic circumstances in which disagreement *can* be reasonable. Thinking about CDR leads us to recognize epistemic contexts that would otherwise be overlooked; taking these contexts into account leads us to revise our views about aspects of current SAE.

The Toolbox—Philosophy in Action

While the contrasting and conjoining epistemological regimes that characterize cross-disciplinary research provide a unique and powerful environment for investigating assumptions and perspectives within epistemology, existing epistemological work provides an equally powerful tool for overcoming the epistemic obstacles that inhere in cross-disciplinary research. Researchers who are collaborating across disciplines to achieve a common goal must attain a degree of epistemic harmony, despite incongruent disciplinary methodologies, in order to generate knowledge as a collaborative team. This can be difficult or even insurmountable, even if other obstacles—such as collaborative logistics or group dynamics—are acknowledged or resolved. Basic philosophical differences between researchers with contrasting accounts of knowledge or justification can inhibit collaborative progress at a basic level if these differences remain undiscovered and unresolved, and it is just this contrast that separates the methodologies and epistemic frameworks of varying disciplines. Given this, it seems clear that successful collaborative work which crosses disciplinary boundaries will require attention to the philosophical differences bound up in epistemic integration. Epistemology, then, constitutes a clear starting point from which to craft and employ techniques that enhance the understanding and facilitation of integrating epistemic regimes in cross-disciplinary research.

How can the insights of SAE be brought into “contact” with the day to day activities of CDR practitioners? One example of this work is the Toolbox Approach under development at the University of Idaho and Boise State University. In this project, we have constructed a specific framework of philosophical statements—the *Toolbox*—that can be discussed by research groups which may benefit from the identification and investigation of underlying assumptions about their epistemic methodologies and assumptions. It has been found that even a relatively brief discourse concerning validation, objectivity, motivation and other philosophical components of the research process has been helpful in improving a team's ability to integrate. In facilitating these toolbox sessions, it can often be helpful merely to point out to researchers that difficult questions concerning, say, knowledge validation are genuinely difficult questions. Demonstrating this difficulty to the respective members of a research team gives them a more immediate and profound respect for the multifaceted epistemologies brought to the table by their colleagues. What may have become dismissiveness or divisiveness instead can develop into informed integration, thanks to the philosophical intervention. And when it comes to being aware of and understanding the difficulties in question concerning the nature of knowledge, nobody is a better candidate for this philosophical intervention than the epistemologist.

There is a niche here for practical applications of epistemology, and it is our contention that this niche remains relatively unexplored. The value that epistemology can bring to cross-disciplinary research is evident, and the epistemological community would be remiss to do otherwise. The work by which cross-disciplinary research would benefit here is not only theoretical in nature, but in fact directly applied to the process of research.

Conclusion—What We’ve Learnt Today

We hope that the sketches we have presented today—of the impact of CDR on SAE and of the impact of SAE on CDR—are enough to strongly suggest the value of CDR as an object of study and an area of contribution for epistemologists. It is also our view that the more interactive the role of epistemology in CDR the more valuable for both SAE and CDR.

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