Cross-Disciplinary Research as a Platform for Philosophical Analysis

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** DRAFT – Please help **

1. 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 also supplies a context in which many vexing philosophical questions arise. Examples include the following:

- How can different and potentially incommensurable disciplinary ontologies be synthesized into an integrated set of metaphysical commitments?
- How can different technical meanings be negotiated to yield a common understanding of the research landscape?
- How can normative questions about intellectual and social virtue be answered in the multicultural context of cross-disciplinary research?
- What is the logic of integration that underlies epistemic combination in cross-disciplinary research projects?

While scientists participating in these efforts have grappled with these questions (e.g., Benda et al. 2002, Campbell 2005, Stokols et al. 2008), philosophers have been slow to respond, especially in the analytic tradition that is our focus in this article. There is philosophical literature on CDR, often published under the banner of “interdisciplinarity”; for example, a number of philosophers contributed to The Oxford Handbook of Interdisciplinarity (Frodeman et al. 2010), and there is also an upcoming special issue of Synthese to be devoted to “Philosophy of / as Interdisciplinarity.” There is also literature in analytic philosophy on related issues, such as aspects of integration in biological science (e.g., Mitchell 2003, Leonelli 2008, O’Malley and Soyer 2012) and creative, negotiated interpretation in linguistic exchanges (e.g., Cappelen 2008). But the careful attention paid to interdisciplinarity by scientists and philosophers has not had much influence on the analytic literature in philosophy.

With this article, we hope to forge a stronger connection between these loosely connected efforts. In particular, we argue that CDR can serve as a full-service philosophical platform, supporting inquiry into many philosophical issues of interest to analytic philosophers. It is a robust and complex human activity that has significant epistemic, metaphysical, and normative dimensions. More specifically, as a type of research, CDR

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1 As we understand it, CDR is different from, for example, interdisciplinary research. For details, see Section II below.
2 In what follows, we focus on CDR in the sciences, although we believe that the general lesson of this essay applies across the CDR spectrum.
is a complex human activity that is essentially epistemic. The point of CDR is to produce new knowledge and understanding, and it does this by bringing different epistemic regimes to bear on multidimensional issues and problems that resist monodisciplinary treatment. The result is often a collision of ontological commitments, methodologies, and research worldviews, scattering a cloud of philosophically rich questions and concerns that could serve as inputs into analysis in core philosophical areas.³

In what follows, we supply a two-pronged argument for the conclusion that core areas in analytic philosophy can benefit from attention to CDR. After providing a brief account of the nature of CDR, we begin by providing an intensional argument that exploits its complex epistemic character for two purposes: first, maintaining that CDR is conceptually fecund because it highlights central differences among fundamental aspects of research worldviews, and second, that these differences among disciplinary inputs to the process of CDR underwrite an intellectual diversity that challenges the reliance of analytic methodology on paradigmatic exemplars. Second, we provide an extensional argument that uses specific cases to establish the local impact of CDR on philosophy. We supply four brief examples of how consideration of CDR reforms philosophical projects—our aim here is to suggest the breadth of philosophical projects that CDR can put into a new light. We then proceed to a more detailed example of CDR’s impact on philosophy involving the problem of reasonable disagreement, both to make the case for impact more plausible and to begin illuminating the mechanism(s) of that impact. 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. We conclude by submitting a first account of the overall impact of CDR on philosophy.

2. The Nature of Cross-Disciplinary Research

Consider the following examples:

A) 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).

B) One of the authors has participated in an on-going project that aims to design and deploy a fleet of collaborating autonomous underwater vehicles. His contribution to this project, dominated largely by mechanical and electrical engineers, has been to apply expertise in the conceptual aspects of natural language semantics and

³ The potential impact of CDR on philosophical analysis is one half of a feedback loop involving CDR and philosophy. In the other direction, philosophy has an opportunity to contribute, practically, to the success of CDR, either through direct involvement as a partner in cross-disciplinary efforts or through facilitative support of CDR. We find both directions of the loop fascinating and have discussed the impact of philosophy on CDR elsewhere as it is instantiated by the Toolbox Project (reference omitted).
pragmatics to develop agent communication language protocols and associated logics for information transfer and interpretation. (See Bean et al. 2009.)

C) 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.

D) 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. Efforts such as these vary along a number of dimensions, such as: number of participants, from a single individual (D) to a large-scale collaboration (A); disciplinary “width”, associated with the degree to which participating disciplines differ from one another epistemically and metaphysically, from narrow (B, D) to broad (A, C); and epistemic integration, from multidisciplinary mixtures (C) to interdisciplinary compounds (A, B, D). A fully adequate characterization of CDR would require systematic description of its multidimensional variability, but that isn’t our quarry in this essay (see REF, REF). We settle for an informative gesture in its direction.

CDR is research conducted across disciplines. Thus, first, we focus on research, as distinct from practice. As research and practice bleed into one another, this can be a difficult distinction to make, but we take (A) through (D) to supply illustrative, paradigmatic cases of CDR. We take research to be fundamentally about knowledge production, and so it is an essentially epistemic enterprise, whereas practice will tend to be less about knowledge production than knowledge implementation.

Second, the research we focus on is cross-disciplinary. 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. To be fully explicit about this, we must specify what we mean by ‘discipline’ so that it is clear what it means to cross two. 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 (cf., Klein 1996). We then define ‘cross-disciplinary research’ as research involving the participation of more than one discipline, so understood. As we understand it, CDR does not require significant integration or collaboration; further, it does not discriminate as a category between multidisciplinary, interdisciplinary, pluridisciplinary, or transdisciplinary research (cf., Morse et al. 2007).

3. A Conceptual Argument for the Philosophical Fecundity of CDR

The principal claim we seek to establish in this article is that CDR is a fecund source of philosophically interesting research problems that should receive more attention from those engaged in core philosophical areas. We supply two arguments for this: a transcendental one, meant to establish CDR as a natural source of such problems, and an
empirical one, meant to establish the existence of such problems in several core areas of philosophy. In this section, we present the former argument.

Philosophical problems come in all shapes and sizes, but one common type of problem involves inconsistency among commitments we have concerning fundamental concepts. For one example, we act in the world in a way that reflects a belief in free will, but there is also good reason not to make exceptions of ourselves and the events in which we participate when it comes to the purview of fundamental physical laws. For another, we readily acknowledge that certain proper names (e.g., ‘Santa Claus’) are empty, in the sense that they don’t have a referent in the real world, yet we use and evaluate them on all fours with regular, referential proper names. Problems of this sort can be classified as aporia, or as Rescher puts it, “a group of individually plausible but collectively incompatible theses” (2009, 2). The first example can be cast as an aporia in the following form:

1. Human beings act in ways that exhibit free will.
2. Human beings are part of nature and so conform to natural laws.
3. If (1), then not (2). (The Incompatibilist Thesis)

Here, the aporia is generated by commitments that arise out of our employment and understanding of the concepts of free will and physical determinism. The philosophical challenge is to figure out which of these theses to defend and which to reject, thereby dissolving the inconsistency.

Aporia of enduring philosophical interest will turn on conflict among concepts that figure centrally into fundamental theories of metaphysics, epistemology, or axiology. The example above is instructive in this regard, as it can be cast as an inconsistency that arises out of the concepts that constitute the theses. In particular, the first claim maintains that the extensions of human action and exhibits free will share a non-empty intersection; the second claims that the extension of human action is a subset of the extension of conforms to natural laws; but the third implies that the extensions of exhibits free will and conforms to natural laws do not have a non-empty intersection. While we make no claim concerning the generality of this recipe, it suggests that one way to generate aporia is to locate a triad of philosophically interesting concepts (e.g., human action, free will, and determinism; proper names, reference, and meaningfulness) that are related in a way that imply the possibility of certain types of logical combination even while there is good reason to deny that possibility. The inconsistency that is the hallmark of aporia arises out of the conjunction of an appealing combination with an apparent conflict. Thus, aporia can be generated in a philosophically interesting form if (a) there is reason to believe that a set of concepts can be related in a certain plausible logical combination, (b) there is reason to deny that these concepts can be so combined, and (c) the concepts in question are of fundamental philosophical interest.

With this in hand, we turn to CDR, an essentially epistemic enterprise that aims to produce new knowledge from old knowledge contributed by multiple disciplines that differ according to their research orientations. For our purposes, it is important to
emphasize that disciplines can be understood as forms of research activity differentiated in part by the fundamental conceptual commitments taken on by their practitioners. Disciplinary research orientations differ in various ways, including their ontological commitments, preferred methodologies, confirmation regimens, norms of practice, etc. These ways are rooted in fundamentally different conceptual commitments, and in particular, differences among disciplinary research orientations reflect different metaphysical, epistemological, and axiological characteristics. It is precisely because of these differences in research orientation that different disciplines are included in a CDR effort—harnessing disciplinary differences into a coherent, complex research response is the point of CDR.

This is often easier said than done. Differences at the conceptual level manifest as differences in what one sees, what one says, what one thinks, and what one values (Nikitina 2004). The upshot is often confusion, disagreement, and conflict among researchers who spend more time talking past one another than working together, and this can result in the failure of CDR efforts to achieve their research objectives (REF). While this doesn’t establish that the concepts which frame practitioner research orientations cannot be combined, it does establish that efforts to combine them do not always succeed. And that suggests that in at least some cases or relative to certain attempts, there is reason to deny that certain concepts can be combined, satisfying (b) above. Further, since these conflicts involve fundamental research orientations, they will be rooted in differences among commitments involving core philosophical concepts in metaphysics, epistemology, and axiology and so satisfy (c) as well.

But while some CDR efforts wind up in failure, others do not; in fact, disciplinary combination under the banner of CDR can be a very effective way of responding to consequential, real world problems. As we noted in the previous section, CDR is an increasingly prominent research response to complex problems such as natural resource sustainability (REF), climate change (REF), or food security (REF). Problems like these exhibit characteristics that are the province of no single discipline, and solving them will require addressing those characteristics. As a research approach, CDR recommends pursuing a research solution that is as multifaceted as the problem, where this involves combining disciplines that each have something to say about characteristics of the problem. These responses are often sui generis, crafted to do justice to the specific character of the problem in play and take advantage of the particular set of available resources. As such, there are typically no blueprints available to ensure success—the CDR team can avail itself of a growing number of support resources, but in the end, it must determine for itself how to marshal its collective skill and insight in addressing the problem.

For all the difficulty associated with this type of work (NAS 2005, Lele and Norgaard 2005), CDR efforts regularly succeed in achieving their research objectives. The measures of success appropriate here are the standard academic ones (e.g., grant dollars, presentations, publications) as well as translational ones that concern impact of research on non-academic partners and stakeholders. One strong indicator of this is the growing attention being paid to CDR by federal funding agencies in the United States, including
the NSF (e.g., the Integrative Graduate Education and Research Traineeship program and the Science and Technology Center program), the NIH (e.g., the NIH Roadmap emphasizes translational research, which is almost invariably cross-disciplinary), and USDA-NIFA (e.g., the highly interdisciplinary Coordinated Agricultural Projects). CDR is effective, which is to say that combination of different disciplines can be successful, and this implies that the concepts which frame disciplinary engagement with a range of issues can themselves be combined into productive logical combinations as required by (a) above.

By satisfying the sufficient conditions mentioned above, these considerations motivate the conclusion that CDR can generate philosophically interesting *aporia*. The philosophically sensitive can find philosophical problems in many places, but CDR represents a rich source of *aporia*. An essentially epistemic practice, CDR brings philosophically substantive concepts to the surface as a result of differences among disciplinary research orientations, highlighting conceptual incommensurability even while it succeeds in achieving conceptual integration. The observant philosopher will be able to locate interesting and potentially novel problems in the context of CDR, a source that remains largely untapped by those working in core philosophical subdisciplines.

**What We’re Not Doing**

Philosophy as a practice stands in a number of complex relations with other practices. This is reflected in the fact that one typically doesn’t just *do philosophy*; rather, one does *epistemology*, or *philosophy of language*, or *environmental philosophy*, or *philosophy of biology*. A distinctly modern phenomenon, this hyperspecialization is a by-product of the institutionalized academic context within which philosophy has been located in the west (Frodeman 2008), but the broad sweep of disciplinary connections also indicates that there is a philosophical side to much of what concerns human beings. This is also true of cross-disciplinary activity—philosophers engaged with cross-disciplinary research and teaching operate in different ways depending on how they are related to their work. We can use this nexus of relationships to articulate clearly just what it is we are doing in this article, distinguishing it from similar aims for which it could be confused.

First, we are not doing “philosophy of interdisciplinarity” (Hansson 2008); that is, we are not interested in investigating interdisciplinarity “in a *disciplinary* manner, as a discrete domain of reflection” (Frodeman 2010). Our focus in this article is on core philosophy as practiced in the analytic tradition. Second, we are not engaged in what has been called “philosophy as interdisciplinarity” (Frodeman 2010) or “field philosophy” (Frodeman 2008), which involves philosophers working side-by-side with collaborators from domains of science, policy, and practice on complex problems such as climate change and the sustainable use of natural resources. An instance of what Hansson (2008) calls “philosophy with”, philosophy as interdisciplinarity recognizes the power of philosophy to make a difference as a contributing partner to efforts of public consequence.4 While we

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4 Both ‘philosophy with’ and ‘philosophy as’ are problematic concepts, but in different ways. The former is vague, leaving open the extent to which the work of philosophers is
recognize the importance of this and, indeed, practice it as part of the Toolbox Project (O’Rourke and Crowley 2012), it is not what we focus on in this article. Instead, we are interested in what could be called “philosophy from”, that is, drawing inspiration and examples from cross-disciplinary activity that inform investigation in core areas of analytic philosophy, such as epistemology, metaphysics, and philosophy of language. It arises out of collaborative work with cross-disciplinary scientific groups, but it is not philosophy as interdisciplinarity or philosophy with cross-disciplinary groups in the senses articulated above; further, it is not work aimed at articulating a theory of interdisciplinary or cross-disciplinary activity, but rather informing the practice of traditional areas in philosophy. What we learn about core philosophical themes, such as the nature of linguistic communication or reasonable disagreement, can and likely will inform the philosophy of interdisciplinarity, but that is not our focus in this article.

3. Reframing Philosophy with CDR: Four Brief Examples

Within the context of disciplinary research, conceptual issues often recede into the background—possessing common histories and research worldviews, practitioners often engage in the “normal science” of working out more and more fine-grained aspects of well-established theories (Kuhn 1996). While there are certainly conflicts and disagreements, these tend to be about more esoteric issues that have arisen during the course of disciplinary development. By contrast, CDR supplies a context within which conceptual issues are in the foreground—practitioners do not share histories or worldviews, they often speak different technical languages, and they exhibit different intellectual virtues (Eigenbrode et al. 2007). How they see the world differs, which integrated with contributions from other partners. The former is treated by Hansson (2008) and Dohn (2011) as integrated philosophical work: “philosophy joining forces with other disciplines in order to solve problems of common interest” (Hansson 2008, 480). In Dohn’s view, the goal for “philosophy with” should be a “dialogue” that takes place “between equal partners with distinct voices who have equal rights to call the views of each other into question” (Dohn 2011, 448). But one could certainly do “philosophy with” in a less integrated, more multidisciplinary way; indeed, the third of Dohn’s four “suggestions”, involving the interpretation of research results, could be conducted by philosophers in parallel with the same work conducted by scientists, with the former holding little sway over the latter. “Philosophy as”, by contrast, is ambiguous between the preferred interpretation, involving philosophy in a collaborative role, and an interpretation according to which philosophy itself, as a practice, is interdisciplinary. In fact, philosophy often is interdisciplinary, focusing its critical eye on other disciplines while retaining a commitment to its own methodologies. Before the dawn of academic specialization and the ensuing disciplinary fragmentation, though, philosophy was practiced in a context that prized “general or integrated knowledge” as the “highest type” (Frodeman 2008, 606). Practiced in this way, philosophy would itself be interdisciplinary. A possible third interpretation of this expression might involve taking philosophy to be a general unifying or integrating framework for use in creating common ground in interdisciplinary projects. This is an idea that we have explored in Eigenbrode et al. (2007), among other places.
implies that they deploy different concepts in doing their work and so can encounter obstacles that are attributable to conceptual incommensurability (Petrie 1976). Importantly, disciplines are intellectual cultures, and so the combination of different disciplines in CDR is a type of multiculturalism that gives rise to a host of philosophical issues that are re-formed under the heat and pressure of epistemic recombination. In this section, we supply brief characterizations of four such issues, noting the different features they have in the context of CDR: scientific ontology, the interpretation of language, normative differences across cultures, and the logic of knowledge.

3.1 Scientific Ontology

It is a philosophical commonplace to grant that scientists deploy different ontologies in the course of doing their work (Quine 1969). For example, physicists study strings and fields, chemists atoms and molecules, biologists organisms and their constituent parts, and sociologists societies and groups. Various time-honored philosophical questions can be asked about the wide range of ontological commitments that figure into the scientific disciplines, such as whether they can be combined reductively into an ontological hierarchy, perhaps with the commitments of physics constituting the foundation to which the rest of the commitments are reduced. CDR affords us the opportunity to ask more local questions about how different scientists combine their commitments into a metaphysical picture that can support a research project. At this level, other interesting philosophical issues come up, such as the problem of incommensurability of scale (Benda et al. 2002). Project success will require that the different ontologies be combined in some fashion, perhaps reductively but perhaps in a more compartmentalized, non-reductive way (Miller et al. 2008). More broadly, examination of strategies for managing ontological incommensurability in the context of CDR could yield different models for relating ontology to different ontologies.

3.2 The Interpretation of Language

CDR projects bring together researchers who speak different technical languages, and while this is generally acknowledged, identifying situations in which different words are used for the same concept and the same words are used for different concepts can be difficult (Petrie 1976, Schoenberger 2001). Successful projects will work through the differences that are relevant to their research questions, sometimes systematically but often haphazardly and only after obstacles have arisen (Heemskerk et al. 2003). Attention to the attempt to achieve mutual linguistic understanding in a CDR context highlights the philosophically underappreciated role of negotiation in interpersonal communication.

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5 This is the aim of the Toolbox Project, mentioned above in connection with the first half of the investigative loop. The Toolbox Project runs workshops that feature systematic, philosophical dialogue about research assumptions designed to generate mutual understanding of research worldviews, thereby enhancing cross-disciplinary communication. Among other effects, this dialogue allows collaborators to work through linguistic differences toward development of a project “pidgin” that supports more effective scientific communication. See (references omitted).
Instead of packaging information up to send to one’s collaborators, scientists collaborate in the construction of meaning, negotiating the interpretation of terms and the appropriate circumstances of their employment. This process, known as “joint construal” (Clark 1996), takes place at various levels (e.g., word, utterance, relationship) and is revealed in conversation by discourse markers (e.g., overt agreement, repetition) and other indicators of negotiated agreement. Figure 2 supplies a snippet of naturally occurring dialogue between scientists discussing the meaning of ‘research’. By making the process of conceptual negotiation explicit, CDR highlights the idea that language is essentially a social phenomenon, with meaning being jointly construed by interlocutors in discourse rather than being something coded in the words. This suggests, among other things, that commitment to speaker authority in semantics may be misplaced, and that listeners should be promoted into greater semantic prominence.

| 69. T02P03: | It’s kind of makes me think about art and aesthetics and how art doesn’t have to be applied. It can just be, it can just exist in and of itself and doesn’t, it’s fine that way with, umm… |
| 70. T02P02: | Right, so then what does break, what, why, what’s the value of research then? I’m just… like that’s the question, right? |
| 71. T02P03: | Right. |
| 72. T02P04: | Right. |
| 73. T02P05: | Learning new things. |
| 74. T02P04: | Yeah, the pursuit of knowledge. |

Fig 2. Example of the joint construal of ‘research’ by scientific collaborators.

3.3 Normative Differences across Cultures

One can take ‘culture’ to refer to systems of beliefs, values, and practices that are realized more or less loosely by groups of people who typically self-identify in terms of those systems. As such, disciplines are cultures—they embed core beliefs, values, and practices that are reinforced by communities of people who identify with those disciplines. Membership in a culture is in part a normative matter, with members sharing values and exhibiting virtues that are characteristic of their disciplines. These values and virtues are part of what it is to be, say, a microbiologist or an entomologist—specific standards and skills are crucial to disciplinary success, and those are just the standards and skills
inculcated into budding young scientists in graduate school, where people are introduced into disciplinary culture. Representatives of different disciplinary cultures interact often on university campuses (e.g., in line at the coffee shop), but CDR brings them together in consequential circumstances where cultural differences can rise to crisis level, threatening the forward progress of the project (Campbell 2005). These efforts are crucibles within which to study the integration of different normative regimens, as well as the development of strategies for identifying and resolving misunderstanding and conflict. As such, they are testbeds for disciplinary localization (Crowley et al. 2010).

3.4 The Logic of Knowledge

The epistemic development of disciplinary knowledge will exhibit various patterns of inference, or “logics”, as older knowledge frames and leads to newer knowledge. These logics are reflected in the different methodological and confirmation regimens employed by the disciplines. Through the combination of disciplines, CDR makes success depend on the ability of its practitioners to integrate these logics into a pattern of inferences that is at once defensible and conducive to pursuit of project goals. An especially interesting logical challenge emerges, viz., the challenge of modeling the integration of knowledge in the context of CDR. This sort of logical integration can be done at different levels. For example, one can model the practice of integration in terms of agents that negotiate and make various compromises in developing a sustainable knowledge set; alternatively, one can model it in propositional terms by developing inference rules that take seriously the nature and degree of evidential support for research claims.

4. CDR and Reasonable Disagreement: A Detailed Example

The purpose of this section is to supply a more detailed example of the impact that CDR can have on philosophical inquiry. In particular, we defend the claim that study of CDR can inform epistemology, and specifically, analytic epistemology (i.e., epistemology as it is practiced in the Anglo-American analytic tradition). In our argument by example, the epistemological topic we choose to consider is reasonable disagreement.

According to Feldman and Warfield (2010, 1) the study of disagreement is inspired by real world examples such as when, “Two expert weather forecasters disagree about the weekend forecast. Two equally well-informed economists disagree about the most likely movements in interest rates….” The intuitive puzzle here seems clear—which of the experts should we take seriously? To make this sort of real world scenario philosophically tractable, a certain amount of idealization is required. Feldman and Warfield identify two key idealizations in the discussion of reasonable disagreement:

1) The notion of a “peer” (e.g., the two weather forecasters) is made precise as follows: “peers literally share all evidence and are equal with respect to their abilities and dispositions relevant to interpreting that evidence” (Feldman and Warfield 2010, 2).
2) The notion of ‘uniqueness’ is introduced, “This is the thesis that a given body of evidence justifies exactly one attitude toward any particular proposition.” (Feldman and Warfield 2010, 6)

Given these two idealizations, the core philosophical puzzle of this philosophical inquiry is made clear by the following example.

4.1 Reasonable Disagreement—One Current Version

The heart of the reasonable disagreement puzzle can be found in Richard Feldman’s story about two doctors, J and K, both of whom are seeking the cure for some disease (Feldman 2003, 182-188). 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. Uniqueness of cure is assumed here, that is, if X is the cure, Y is not, and vice versa. 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 other’s work yet continued to believe their answer was correct? At this point J and K have become “peers” in the technical sense mentioned. 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:

1) J justifiably believes that X is the cure. AND
2) J justifiably believes that K justifiably believes that Y is the cure. AND
3) K holds symmetric views about the situation.

That is, J has good reason to think that, based on evidence shared with K, 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 ~P. Thus J possesses inconsistent beliefs, given the uniqueness assumption. Far from being desirable, epistemic tolerance is incoherent. Feldman’s view is that the epistemically rational course for J and K is to withhold judgment regarding whether X or Y is the cure they seek, and this seems plausible. It is not, however, the only game in town. Some thinkers suggest that there are forms of compromise other than withholding judgment, such as modifying their levels of credence/acceptance (e.g., Elgin (2010), Elga (2010)). Others have suggested that there may be reasons for sticking with their original position, at least in some circumstances (e.g. Conee (2010), Fumerton (2010) and Kelly (2010)). Alvin Goldman (Goldman 2010) suggests that there is a sense of justification that supports both the uniqueness assumption and a version of the tolerant approach to disagreement. Despite this variety of responses there is an underlying similarity—none of these approaches supports the tolerant outcome as originally described, that is, where J and K rationally regard both results as justified.

But what if we enrich his example in a way brought to our attention by CDR?

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*6* It turns out there is both an absolute and an agent relative notion of justification!
4.2 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 malaria in central Africa (let’s say Rwanda). Further, assume that J is a microbiologist and K an epidemiologist. J discovers that malaria arises as a result of an agent’s becoming infected with eukaryotic protists of the genus *Plasmodium* and as a result argues that the cure for the disease is the administration of the drug quinine. K discovers that malaria is spread via mosquito and advocates public health measures (e.g., mosquito nets, poisoning mosquitos) to prevent mosquito bites and/or eliminate mosquito populations as the cure for the disease. Assume uniqueness manifests itself here in the form of a government mandate to fund only one cure. If J and K are going to make a joint report to the Rwandan government on how to deal with malaria they must identify a way to reconcile their research. They do well in this task if they begin by coming to understand the perspective of the other. That is, to recognize, without rejecting their own work, the validity of the other’s perspective. But surely to be in such a situation is to be party to a reasonable disagreement—just like the weather forecasters and the economists. And the right thing to do in this case is not to alter their confidence in the work that has been done but rather to discuss how they might rationally integrate their perspectives. In the CDR context then the tolerant outcome—that is, judging all the work to be good and in conflict—is the right one. But that is not an option available within the analytic debate as it stands.

In our view, the right way to think about what J and K are doing with their joint research on malaria 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 involves the reconceptualization of the research question—is an important new aspect of epistemology that is revealed by the study of CDR. Here uniqueness of cure is imposed from without as a practical constraint, whereas in the Feldman case the suggestion is that it arises from within as an ontological feature of the example being described. In both situations, though, a contradiction threatens that generates inconsistent beliefs; further, the constraint in this case is much more in line with the real-world cases that motivated the problem in the first place.

Reconceptualization involves negotiating how to combine distinct perspectives that all parties recognize as being both correct in their own terms and clearly relevant to the issue at hand. We think of this as in some ways like the task of reconstructing a 3-D object from orthogonal 2-D perspectives.
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 while continuing to recognize the incompatibility of those interpretations. That is, *reasonable disagreement* (in at least some cases) involves achieving and recognizing incompatible justified beliefs. It is crucial to acknowledge that this is a dynamic epistemic situation. It calls for the development of a new research perspective within which the incompatibility of prior work can be seen resolved. The key point here is that the incompatibility of two perspectives need not be resolved by rejecting one or both of the perspectives. Sometimes it can be resolved by adopting a new approach to the problem that the perspectives are meant to address. Just as two vehicles apparently on a collision course in two dimensions are seen to be comfortably distant in three dimensions, so too one can seek to address the disagreement between the epidemiologist and the biochemist not by rejecting one or the other point of view but rather by re-framing the challenge they are both addressing.

Before moving on to an analysis of the differences between our account and Feldman’s, we must acknowledge that we are “skipping over” a highly complex piece of real world epistemology, that is, the achievement of a state of reasonable disagreement. Few, if any, CDR teams come into existence with all of their members having an accurate appreciation of the work of the others on the team. More typically there is a great deal of confusion and misunderstanding that lead to situations where team members take themselves to agree on a topic when their perspectives are incompatible, or disagree when their perspectives are compatible. Overcoming this kind of *unreasonable* agreement (or *unreasonable* disagreement) is one of the greatest challenges confronting CDR practitioners. It is also an area where philosophical intervention can greatly benefit CDR practitioners by facilitating the move from states of *unreasonable* agreement or disagreement to states of reasonable agreement or disagreement. Note that the achievement here is movement from unreasonable collective states to reasonable ones—not movement from disagreement to agreement. Agreement is not always the reasonable or desirable end state. Philosophy effects this transition by providing a common

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9 In this regard our account is similar to discussions of the “tipping problem” in the analytic epistemology literature (e.g. Christiansen (2007), Kornblith (2010)). In that situation, epistemic peers disagree about the amount of the tip on their shared meal. The suggestion is that in this case the peers withhold judgment about the amount of the tip. The key point from our perspective is that they do so only briefly, while they recalculate the tip amount. That is, the withholding of judgment here is dynamic—it is not a stable epistemic state. The difference in the two cases is that in the tipping case evidence, context, question, and method are held constant, which means there must be an error somewhere and the right response to that is to withhold until the correct answer has been determined. In contrast in the malaria (CDR) case the acknowledged validity of the two approaches calls for reconsideration of the research perspective (i.e., either the evidence, context, question or method)—typically by a revision of the question driving the research.

10 Developing this new perspective is the second stage mentioned above.
framework for the discussion of the differing styles of doing science that team members bring to the team.\textsuperscript{11}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
Unreasonable Disagreement & Reasonable Disagreement \\
\hline
Unreasonable Agreement & Reasonable Agreement \\
\hline
\end{tabular}
\caption{Philosophy can aid in moving collaborative projects from unreasonable collective states to reasonable collective states.}
\end{table}

It is also important to recognize that while the story we have just told is one that we think is right, it is one that conflicts with Feldman’s account, which is an influential, contemporary perspective on the topic. Our challenge then is to offer a perspective that both explains our point of view and accounts for the limitations of Feldman’s.

4.3 Back to Analytic Epistemology

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 to be used. Even if you and I are trying to answer the same question in the same context 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 the 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 \textit{the} appropriate method; rather, we are limited to the claim that it is warranted by \textit{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 M17) that K’s belief that E supports the claim that C2 is justified.

\textsuperscript{11} Effecting transition from unreasonable collective states to reasonable ones is the primary goal of the Toolbox Project, mentioned in note 3 above. See (reference omitted).
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 (i.e., the uniqueness hypothesis) 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 that agents attempting to disagree reasonably share ECQ and that ECQ fix M. His commitment to the first of these is suggested by his analysis of the J and K case. His commitment to the second is suggested by his analysis of the good/bad teacher case (Feldman 2003, 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.

Perhaps, however, we are being premature in declaring analytic approaches to reasonable disagreement flawed. It seems to us that there are at least two, prima facie plausible responses to the CDR cases that fit within the analytic approach. The first option is to reject the idea that the epidemiologist and the biochemist are, in the relevant sense, peers—this arises from a natural reading of Feldman’s notion of evidence. The second option, due to Goldman, is to acknowledge two standards of justification and to claim that on one of those standards both the epidemiologist and the biochemist are justified continuing to hold onto their own perspective. Ultimately, we believe neither approach does justice the situation we have described.

For Feldman, epistemic peers “… literally share all evidence and are equal with respect to their abilities and dispositions relevant to interpreting that evidence.” (Feldman and Warfield 2010 p. 2) A friendly reading of this requirement might lead us to something like Goldman’s notion of “total evidence” (Goldman 2010 p. 192)—the entirety of beliefs, experiences, and cognitive processes relevant to the issue at hand. Again a friendly reading of this concept suggests that all of ECQM will be part of an agent’s total evidence. So, given that on Feldman’s account epistemic peers share total evidence, and that total evidence fixes all of ECQM, it is simply not the case that the epidemiologist and the biochemist are epistemic peers—since, ex hypothesi, they do not share a method. If they are not peers then the CDR case simply misses the point of the contemporary debate about disagreement and so nothing has been lost by failing to think hard about CDR cases. We acknowledge that this move will undermine the CDR challenge but it does so at the cost of rendering the philosophical problem irrelevant to

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12 We operate here under the assumption that to “share a method” is to employ the same method. Another interpretation of “share a method” that seems consistent with a reasonable interpretations of peerhood would be to allow that two investigators might share a suite of methods in that they are both capable of using them all, even though in a particular case they utilize different methods. That could be true in the case under consideration if the epidemiologist and biochemist are sufficiently interdisciplinary to know the methods of the other area. On this interpretation, the CDR case remains relevant and in force. This way of looking at peerhood is related to what we say below about epistemic standards.
the real world examples that motivated it. If being a peer requires sharing ECQM, is it reasonable to think that Feldman’s weather forecasters or his interest rate-predicting economists are peers? We don’t think so. In sum we think this response to the CDR case of reasonable disagreement is caught in a dilemma: it can treat the notion of “peer” strictly (matching ECQM) which rules out the CDR case but also rules out the kind of situations that inspired the inquiry in the first place. The other choice is to treat “peer” in a more catholic fashion—this allows the approach to capture the initial motivating examples but at the cost of having to include the CDR case amongst those to be considered. It seems clear to us that the right approach here is the catholic one.

According to Goldman (Goldman 2010), while there is a single correct set of epistemic standards (a version of the uniqueness hypothesis), it may nonetheless be possible for different epistemic agents to have justified beliefs in distinct epistemic standards; in such a case, while at least one of the agents will be wrong, neither will be at fault. Fundamentally this is because forming beliefs about appropriate epistemic standards, like forming any other belief, is susceptible to the possibility of justified false beliefs. In the malaria case, this will mean that the epidemiologist and the biochemist will rationally remain confident in their own perspective. What Goldman’s account says about how these researchers view the other’s work is less clear. They might regard the other’s work as unjustified, if they apply their own standards of justification. Alternatively, they may regard the work as justified—from-the-perspective-of-the-other, that is, as being an appropriate response to the evidence, given the set of epistemic standards the other is using, although they themselves would not accept those standards. We submit that neither of these options amounts to the full-fledged appreciation of the other’s work is less clear. They might regard the other’s work as unjustified, if they apply their own standards of justification. Alternatively, they may regard the work as justified-from-the-perspective-of-the-other, that is, as being an appropriate response to the evidence, given the set of epistemic standards the other is using, although they themselves would not accept those standards. We submit that neither of these options amounts to the full-fledged appreciation of the other’s perspective that our example calls for. Furthermore, as Goldman admits (Goldman 2010 p. 210), there is nothing in his account that addresses how the agents should respond to their distinct perspectives. This suggests that the agents might not see the situation as a disagreement at all but merely as a choice of options. Again this is not an adequate analysis of our CDR example. So, while we admire much of Goldman’s account of disagreement—e.g., the focus on the dynamic, diachronic (Goldman 2010 p. 209) aspects of disagreement and the sensitivity to important differences in kind among kinds of evidence (Goldman 2010 p. 208) that is analogous to our interest in ECQM—we don’t think that his view has the resources to adequately account for our CDR example.

In sum, analytic accounts of reasonable disagreement are at worst flawed and at best limited because they lack the resources to account for the type of reasonable disagreement that arises in the context of CDR. Paying attention to CDR yields a richer and more adequate account of reasonable disagreement than that developed by standard philosophical methodology. Note that we are not saying that analytic approaches to reasonable disagreement are never right; rather, we hold that they are 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 analytic epistemology.
4.4 Sketching a General Account

Why is it that disagreement between epistemic peers suggests to practitioners of analytic epistemology some kind of failure by at least some of those peers rather than the possibility that the subject of inquiry is richer and more complex than previously thought? That is, why does analytic epistemology overlook the kind of reasonable disagreement that is so salient from a CDR perspective? In our opinion this is the result of a tendency among philosophers to give diversity short shrift. We tend to pursue our search for underlying commonalities by reifying and ideal type and treating divergence from that type as “noise”. So, in the case of reasonable disagreement we create the ideal type of a disagreement—one between “epistemic peers” who share every aspect of their epistemic situation and then ignore (or massage into the canonical format) any disagreements that fail to “fit the mould”. But this approach distorts much of the phenomena under study and as a result the philosophical discussion misses its real world target. We suggest that in the study of disagreement we do better to recognize that there are interesting and philosophically (epistemically) important differences between epistemic peers that lead to interesting differences in the kinds of disagreement they may have. So, get rid of the single ideal type and embrace a parameterized notion of epistemic peer!

5. Conclusion

That philosophers can, and should, benefit from turning their attention toward CDR strikes us as clearly demonstrated by the examples we have advanced in this paper. Bearing in mind that we restricted our examples to scientific CDR, it seems likely that the opportunities available to adventurous philosophers who explore the whole range of CDR are even greater than might appear on first exposure to this piece. Less evident, but of greater value, is the benefit to philosophy. We need to work out why an area of philosophical investigation as exciting as CDR has been ignored by the philosophical community for so long. In our view this is the result of implicit standards for idealizing real world situations into philosophical problems that treat diversity as a distraction from the underlying core issue. These standards are both widespread and implicit – our hope is that by making them explicit we will begin to enrich the range of methodologies open to philosophers. We believe such enrichment will lead to greater understanding and real world applicability of philosophical research. As a first step in this methodological enrichment, it seems to us that a better approach to philosophical questions in general would be to take diversity seriously: get clear about the variety of approaches to a topic

It is important to acknowledge that not all work in epistemology idealizes away difference; standpoint theory (both feminist and Marxist) (e.g. Anderson (2011)) and Goldman’s notion of Weak Justification (Goldman 1988) are two good examples of theoretical frameworks which take differing epistemic frameworks seriously. What they lack, in our opinion, is a good account of how these differing perspective interact. The full value of studying CDR then involves not just an appreciation of difference but also insight into ways in which that difference may be negotiated in an epistemically legitimate way.
and how those approaches interact and use that information to identify the crucial features of that region of conceptual space.

Acknowledgments

References


