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EPISTEMOLOGICAL IMPLICATIONS OF REPRESENTATIONAL PLURALISM

BY

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ABSTRACT

In this dissertation I argue that the framework under which epistemology operates should be broadened to account for developments in cognitive science that indicate that a good deal of cognition and reasoning involves the use of non-linguistic representations.

In chapter 1, I argue that, although epistemology is the theory of knowledge, epistemologists generally operate as though their field is simply the theory of *propositional* knowledge. Epistemologists generally assume that knowledge is a certain type of belief relation to a true proposition. However, cognitive science indicates that many of our mental representations are not belief-like at all, and thereby, not belief relations to propositions. Rather, the mind employs representations that take the form of images, scale models, activation patterns, and so on. I call this claim *representational pluralism*. If some of these non-linguistic representations are constitutive of knowledge, as I argue that they are in later chapters, then this requires a substantial revision of the traditional epistemological framework. I proceed to introduce some potential consequences of departing from the propositional knowledge tradition in epistemology. These consequences pertain most directly to two issues, namely, philosophical methodology and our understanding of normative standards of rationality.

My discussion of methodological issues begins with the introduction of what I call the *analysis problem*. The analysis problem is the problem of developing a conceptual analysis of propositional knowledge and justified belief. I argue that this problem emerged from concerns with skeptical regress arguments and the Gettier problem. The traditional methodology for analyzing these concepts, and hence, for addressing the analysis problem, has consisted in determining the truth conditions for

attributions of knowledge and justified beliefs. To determine these truth conditions, epistemologists develop thought experiments designed to elicit our semantic intuitions regarding the use of “knowledge,” “justified belief,” and their respective cognates. After enough intuitions are elicited, we formulate a theory of knowledge or justification.

While this methodology is problematic in its own right, as I argue in chapters 2 and 3, it has also lead to the embrace of an understanding of rationality that is limited and narrow in its application. Rationality amounts to epistemic constraint satisfaction and epistemic constraints provide criteria that allow us to assess an agent’s behavior for good or correct performance. Good, or correct, performance must be understood relative to a specific goal or problem. Since epistemology assumes that knowledge is a certain belief relation to a true proposition, the goal or problem of concern in epistemology is that of forming true beliefs. So, when epistemologists think about rationality, they think of behaving in a way that is conducive to forming true beliefs. In other words, the standards of rationality that epistemologists use to evaluate agents for rationality apply only to agents who exhibit behavior that is aimed at forming true beliefs. So, one reason that the traditional understanding of rationality in epistemology is problematic is because it is inapplicable to agents who have other goals, both epistemic and practical.

The second problem I discuss for epistemology’s traditional understanding of rationality is that the standards of rationality are formulated in abstract conditions that idealize away from various practical constraints to which we are constantly subject. It is important to keep in mind that this second problem is, in some sense orthogonal to the first, although it arrives, at least at times, from the standard epistemological methodology. Nevertheless, even if the traditional epistemological framework is correct in holding that

all knowledge is belief-like, epistemology's traditional standards of rationality are inapplicable to any actual individuals because actual individuals are finite creatures with fixed cognitive architectures. Since epistemology's traditional standards of rationality are formulated in idealized conditions that abstract away from these limitations, they should be understood as guiding the behavior of agents who exist in those sorts of environments. But agents who exists in those sorts of environments will be subject to more demanding standards than actual agents. Actual agents, of course, cannot meet these standards, and, since ought implies can, cannot be held to them.

In short, chapter 1 argues that we need to depart from the epistemological status quo in order to accommodate the possibility of non-belief-like, that is, non-propositional knowledge. The dissertation proceeds to explore some of the consequences of this departure, specifically the consequences for philosophical methodology and our understanding of rationality in epistemology.

In chapter 2 I discuss knowledge-how, a type of knowledge that many have argued is non-propositional. In the first part of the chapter I discuss two intellectualist positions, that is, positions that hold that know-how is propositional. Stanley and Williamson argue that propositional knowledge is both necessary and sufficient for know-how, while Bengson and Moffett argue that propositional knowledge is not sufficient, but is necessary, for know-how.

Stanley and Williamson's position is that knowing how to X amounts to knowing, under a practical mode of presentation, that some way is a way for one to X. Against their position, I argue that if practical modes of presentation do the work that is required of them, then positing them amounts to granting that non-propositional knowledge is

necessary for know-how. According to Stanley and Williamson, practical modes of presentation explain the connection between know-how, dispositions, and actions. However, these dispositions are presumably those that enable performance, and in order to have these dispositions, I argue that we need to practice the activity in question. Through this practice, we acquire the content that gives rise to the relevant dispositions. Following representational pluralism, it is highly implausible that this content is always linguistic or propositional. Hence, positing practical modes of presentation amounts to positing non-propositional content.

Bengson and Moffett concede that there is a non-propositional element that is necessary for know-how. Specifically, they argue that in order to know how to X, one has to stand in a non-propositional knowledge relation to a way of X-ing. However, they also argue that knowing how to X requires propositional knowledge because one can stand in a non-propositional relation to a way of X-ing without knowing that it is a way of X-ing, and thereby fail to know how to X. As I argue, their position entails that many clear-cut cases of knowing how are not cases of knowing how because the relevant agents do not know that the way in which they X is the way in which they X. Taken together, my discussion of Stanley and Williamson and Bengson and Moffett shows that propositional knowledge is neither necessary nor sufficient for know-how.

The second half of chapter 2 discusses the origins of the contemporary know-how debate going back to Gilbert Ryle. I argue that, since Ryle's time, two debates have been taking place in the know-how literature: one regarding the semantic analysis of know-how ascriptions and another regarding how we ought to explain various skills or abilities. The first debate is concerned with truth conditions for sentences such as, "Hannah knows

how to ride a bicycle,” while the latter debate is concerned with determining whether skills are the result of applying a “theory” or stored propositional knowledge, or are the result of the processing of non-linguistic information.

Unfortunately, these debates have been entangled in the literature. For instance, some philosophers, including Stanley and Williamson, Bengson and Moffett, and Ryle, have made inferences about how we ought to explain skills or abilities on the basis of semantic analyses of know-how ascriptions or appeals to ordinary language. Both of these strategies assume that language gives us the correct truth conditions for sentences that use mental terminology and that scientific accounts of the mind are beholden to language. In other words, these strategies amount to what Martin Roth and Robert Cummins call *epistemological poaching*.

As an alternative approach that disentangles these debates, I argue that the representational pluralist thesis needs to be taken seriously. The use of epistemological poaching tacitly assumes that the thesis is false and that cognition is structured around a language of thought that has a similar structure to natural language. Taking representational pluralism seriously can allow epistemology to develop a broader, yet more specialized, framework that bridges the longstanding gap between the field and empirical approaches to understanding knowledge.

In chapter 3 I argue that epistemology’s failure to take representational pluralism seriously has skewed the field’s understanding of normative standards of rationality. I discuss two ways in which epistemology’s normative standards of rationality are limited. First, they apply only to agents with purely linguistic or belief-like cognitive systems.

Second, they apply only to cognitive systems that are capable of meeting them, due to what I call the *ought-can principle*.

But before discussing these limits on epistemology's normative standards of rationality, I consider one way in which a proponent of traditional epistemology might try to argue that representational pluralism does not require substantial revision of epistemology's framework. I label this type of argument the *doxastification strategy*. More specifically the doxastification strategy constitutes an attempt to argue that apparent cases of non-propositional knowledge can be accommodated within epistemology's propositional framework.

Before discussing the doxastification strategy in depth, I present *prima facie* evidence for what I call *epistemological pluralism*, the thesis that there are many types of knowledge, many of which are non-propositional. The first type of *prima facie* evidence for epistemological pluralism comes from representational pluralism. If representational pluralism is true, there appears to be no reason to hold that only linguistic representations can be constitutive of knowledge.

The second type of *prima facie* evidence comes from semantics. We often make knowledge attributions in which it appears the thing known is not a proposition. For instance, we say things like, "Jones knows how the New York subway system is laid out," or "Jones knows what "God Only Knows" sounds like. In the first case, the thing known appears to be, not a proposition, but the layout of a subway system. In the second case the thing known appears to be, not a proposition, but the sound of a song.

Taken together, we can take semantic data to give us an indication as to what sorts of things qualify as objects of knowledge. Meanwhile, the psychological evidence

provides us with insight regarding how these objects are mentally represented. The layout of a subway system is naturally represented by a map, while the tune to a song is naturally represented in auditory memory or in a score. Hence, it appears, at least *prima facie*, that we have knowledge that is, in part, comprised of non-linguistic mental representations.

One might, however, employ the doxastification strategy to argue that we can understand these cases of apparent non-propositional knowledge in terms of propositional knowledge. When one knows, for instance, how the New York subway system is laid out, what one knows is a proposition, namely, the proposition that *the New York subway system is laid out like this*, where “this” refers to a map of the subway system.

However, the doxastification strategy divorces the content that does the genuine evidential work from the content of what is known. Certainly knowing how the New York subway system is laid out allows one to know that the subway system is laid out like *this* (again, where “this” refers to a map of the subway system). But the problem is that one can know this proposition without having any idea how the New York subway system is laid out. One can be reliably informed that the map in question accurately represents the subway system’s layout without ever taking a look at the map and thereby know that the subway system is laid out like *that*. But in order to know how the subway system is laid out, one needs access to an actual representation of the system, that is a map (mental or otherwise).

After discussing doxastification, I argue the problems with epistemology’s standards of rationality can be resolved by reconciling the field with the relevant findings in cognitive science, that is, findings that support representational pluralism. . I argue that

the current standards of rationality in epistemology apply neither to individuals nor to collectives or institutional cognitive systems. These standards cannot be applied to the individual because doing so violates the principle that ought implies can. In other words, these standards require that individuals exceed their capacities. These standards cannot be applied to institutions, such as the institution of science, because they are not equipped to evaluate the use of non-linguistic representations that is ubiquitous in scientific reasoning.

Next, I discuss several problems with traditional methodology in epistemology, and motivate an alternative approach. The first problem is that it is not clear what the target of a conceptual analysis of knowledge is. If one thinks we need an analysis that is correct in all possible worlds, then it is not clear what could possibly constrain such a project. Though appealing to intuition is a standard approach, there does not appear to be any reason to think that intuitions are equipped to provide any evidential support for a theory of knowledge. I argue that, instead of pursuing an analysis of knowledge in the traditional manner, we should ask what role knowledge plays in the various domains in which it is employed.

In chapter 4, I examine the role that knowledge plays in two domains: everyday life and the institution of science. In everyday contexts, I argue that knowledge plays a warrant-granting role for action. This way of thinking about knowledge has drawn some attention in the epistemology literature from Keith DeRose, Jason Stanley, John Hawthorne, and Jeremy Fantl and Matthew McGrath, amongst others. However, I argue that none of these “pragmatic encroachment” approaches draw the correct connection

between knowledge and practical affairs. In particular, many of these accounts are designed to be supplements to more traditional, independent accounts of knowledge.

Rather, I suggest, that in order to take pragmatic encroachment seriously, knowledge needs to be understood as that which plays the role of making an action rational under realistic conditions in which time and memory are limited. That which makes an action rational is often different than that which makes a belief rational. Forming beliefs is generally low risk, that is, there is little cost that comes with being wrong. The cost of being wrong comes into play only when we act on beliefs. But when we are simply concerned with the formation of beliefs, and not how we ought to act on beliefs, the risks we undertake are generally minimal. Because of these differences, the formation of beliefs is subject to different standards of rationality than is acting on beliefs.

When we are genuinely concerned with determining how to act, standards of rationality must be sensitive to limits of time, memory, information, and other resources. Hence, I argue, drawing on work by Gigerenzer and Goldstein, that what makes an action rational in everyday contexts is not a proposition that is known in the traditional philosophical sense, but rather the use of an effective algorithm or set of heuristics.

If this is correct, then knowledge, as understood in traditional epistemology, cannot fill the role that knowledge plays in everyday contexts. Though propositions can serve as inputs into a decision-making procedure, it is effective use of the procedure itself that makes an action rational. In other words, it is an algorithm or decision procedure that fills the role that knowledge plays in everyday contexts.

It is true, of course, that in everyday circumstances, knowledge is often used or discussed in a way that is much closer to the way it is understood in standard epistemology. It does not seem out place in everyday contexts to say, for instance, that I know that Jefferson City is the capital of Missouri. I take this to suggest that we need to understand knowledge in a pluralistic way. While I do think knowledge is often used in everyday contexts to justify or criticize action, it is unlikely that this captures all uses. Ultimately, the issue of what role knowledge plays in commonsense is an empirical question, and so it would be most desirable to accumulate a set of linguistic data to give us a clearer sense of the different roles the concept plays in ordinary usage.

In scientific contexts, I argue that, because science aims to provide us with an understanding of the world, the role that knowledge plays in science is an explanatory role. However, it is possible to have an explanation for a phenomenon that is not correct or accurate. Such an explanation demonstrates, not how *actually* a phenomenon occurs, but rather how *possibly* or how *plausibly* the phenomenon occurs. Since science aims to provide theories that are not only explanatory, but also correct or accurate, the role of knowledge in science is that of an accurate explanatory role.

I begin by noting that Hempel's Deductive-Nomological account of explanation and some subsequent accounts assume explanations are sentence-like in structure. But more recently, many philosophers of science have taken a mechanistic approach to explanation. Machamer, Darden, and Craver, for instance, hold that representations of mechanisms for phenomena explain those phenomena. They note that we use diagrams to represent features of mechanisms, and these diagrams allow us to more easily apprehend the phenomena than linguistic descriptions.

While some philosophers of science, such as Carl Craver and J.D. Trout, deny that explanations have to render their target happenings intelligible, Waskan e al. present compelling empirical evidence that this view is not shared by practicing scientists. Rather, it appears that both scientists and laypersons have a concept of explanation in which intelligibility plays a central role. This supports Machamer, Darden, and Craver's claim that representations of mechanisms render their target happenings intelligible.

There is still a good deal of work to be done to determine the psychological nature of intelligibility or understanding. However, Stephen Grimm suggests that understanding a phenomenon requires having a grasp of the relevant scientific principles and the ability to apply these principles to specific cases. If knowing how entails possessing content that gives rise to dispositions that enable us to perform various abilities, as I argue in chapter 2, then Grimm provides some reason for thinking that know-how is a central component to understanding.

So if knowledge plays the role of explaining the world, and explanations must render the world intelligible, then it appears that the role of knowledge in science is filled by that which enables us to have a correct or accurate understanding of the world. If this is correct, then the role that knowledge plays in science is clearly different than the role it plays in everyday contexts. In everyday contexts, knowledge provides warrant for action. In science, knowledge explains the world by rendering it intelligible. This difference should be unsurprising given that individuals have different goals, resources, and limitations than practicing scientists, or even scientific institutions.

However, one common feature that knowledge in science and everyday life appear to have in common is that they are both related to abilities or skills. In some

everyday contexts, knowledge takes the form of a decision procedure or algorithm. Having propositional information that can serve as an input to an algorithm alone does not provide sufficient warrant or assurance that a certain course of action is rational. To have a sufficient degree of warrant, one also needs an effective procedure for processing or utilizing that information. To put it in somewhat more standard terms, it would seem that *knowing how* to put the information at one's disposal to practical use is essential for making a course of action practically rational. In scientific contexts, knowledge plays the role of enabling us to understand the world, and if Grimm is correct, then understanding consists, at least in part, of a kind of knowledge-how.

There is one final complication that I discuss at the end of the chapter. The complication is that science is generally an institutional or collective endeavor. At the individual level, it appears that the cognitive state that plays the role of knowledge in science will be that of a state of understanding, which Grimm suggests entails having certain skills or abilities. But since science is generally a collective enterprise, following the present proposal will require developing an account of understanding, ability, and skill that makes sense when applied to collective cognitive systems. At present, I am not sure what such an account will look like. However, there are at least two obvious possibilities.

One possibility is that at the collective or institutional level, understanding, skill, and ability are to be understood in roughly the same manner as they are understood at the individual level. For example, we might understand the utterance, "Science understands how planes fly" as serving as shorthand for the claim that a sufficient number of

individual scientists, or a sufficient number of members of a subset of scientists, understand how planes fly.

A second possibility would be that in order for science to understand a phenomenon, it could be the case that different scientists, or collections of scientists, understand different components of that phenomenon. Perhaps none of the scientists, or groups of scientists, understands the phenomenon in full, but if we sum together the individual components that they do separately understand, we will arrive at a full understanding of the phenomenon under consideration.

If the suggestions offered in this section are correct, then they constitute further support for the claim that epistemology stands in need of revision. The traditional epistemological framework is not equipped to evaluate knowledge under the role it plays in science and this role is distinct from the role that it plays in common sense. Hence, we have further need for epistemological specialization and fragmentation.

In chapter 5, I present summaries of the preceding chapters. I then conclude that epistemology, in order to be the theory of knowledge, rather than the theory of *propositional* knowledge, must become more pluralistic. This is not to say that we need to abandon studies of propositional knowledge. But rather, epistemology as a field should become more fragmented, specialized, and connected to scientific accounts of the mind and cognition.

To my parents, Robert and Eileen Harmon.

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CHAPTER 1

EPISTEMOLOGY: A THEORY OF PROPOSITIONAL KNOWLEDGE

1.1 INTRODUCTION

The aim of this dissertation is to argue that the framework under which epistemology operates should be broadened to account for developments in cognitive science that indicate that a good deal of cognition and reasoning involves the use of non-belief like, that is, non-linguistic representations. In short, we need an epistemology that is a theory of knowledge in a broad sense, not simply a theory of *propositional* knowledge. In this chapter, my goal is to motivate the need for such a project.

Epistemologists generally assume that knowledge is a certain type of belief relation to a true proposition. However, cognitive science indicates that many of our mental representations are not belief-like at all, and thereby, not belief relations to propositions. Rather, the mind employs representations that take the form of images, scale models, activation patterns, and so on.

I will be understanding propositional content to be content that *can* be represented linguistically. This, of course, leaves open the possibility that propositional content can also be represented in non-linguistic formats. It is possible that a system that uses imagery or models can realize, with the addition of extra-representational processes, a truth-evaluable state, that is, propositional content. However, as argue later in the dissertation, although non-linguistic modes of representation, such as imagery and models, can bear propositional content, linguistic modes of representation *cannot* bear

knowledge that *can* be linguistically represented. Non-propositional knowledge, on the other hand, is knowledge that *cannot* be linguistically represented. In light of these considerations, I will be using the terms “propositional representation” and “linguistic representation” interchangeably. I will also be using “non-propositional” representation and “non-linguistic representation” interchangeably.

By focusing on propositional knowledge, and the justification of belief, epistemology has ignored the epistemic role that is played by non-propositional, that is, non-linguistic representations. If epistemology’s framework is compatible at all with the use of non-linguistic representations, it is only in cases where these representations, with the aid of extra-representational processes, realize propositional content. But in general, non-linguistic representations bear content that cannot be rendered linguistically. If there are cases of the latter sort that are constitutive of knowledge, as I argue that they are in later chapters, then this requires a substantial revision of the traditional epistemological framework. In this chapter my goal is to explain why such revision is required. I begin by offering an account of why epistemology has focused so narrowly on propositional knowledge. I then give a brief account of the methodology that has come to accompany this focus. Next, I argue that this methodology has led to a very narrow understanding of rationality that is limited in its applicability, and offer two reasons in support of this claim.

1.2 EPISTEMOLOGICAL METHODOLOGY

Traditionally, mainstream epistemology has focused on the conceptual analysis of core epistemic concepts, namely, propositional knowledge and justification. The apparent

need to develop these analyses has emerged from anxieties over two standing issues: skepticism and the Gettier problem. For the sake of clarity, I will refer to the problem of developing these analyses as *the analysis problem*. While there are epistemologists who do not work directly on this problem, they still presuppose the propositional background inherited from discussions of the analysis problem. In this section, I offer brief discussions of skeptical regress of reasons arguments and the Gettier problem as well as some attempts at addressing these issues. Then, I explain the methodology that has been used in this work.

1.2.1 SKEPTICISM

Skepticism is often motivated by appeal to regress of reasons arguments. The following is a representative formulation:

Regress of Reasons Argument for Skepticism

- (R1) In order to know that p, I must have reasons for believing that p.
- (R2) If I have reasons for believing that p, then they either form an infinite chain, a circular chain, or a terminating chain.
- (R3) My reasons for believing p cannot form an infinite chain.¹
- (R4) If my reasons for believing p form a circular chain, then I do not know that p.
- (R5) If my reasons for believing p form a terminating chain, then I do not know that p.
- (R6) Therefore, I do not know that p.

Since the argument concludes, “I do not know p,” and since ‘p’ can take as its value any proposition, it may seem that the argument leads to global skepticism, that is, the conclusion that we cannot have any knowledge. While such an inference may be tempting, it would also be mistaken. *Because* ‘p’ can take propositions, and *only*

¹ Alternatively, one might hold “If my reasons for believing p form an infinite chain, then I do not know that p.”

propositions, as its value, the regress argument, at best, establishes skepticism about *propositional* knowledge, and *only* about propositional knowledge.

Skeptical regress arguments of this sort have led many epistemologists to offer accounts of the structure of knowledge and justification that allows us to avoid the conclusion that we can know no propositions. Foundationalists hold that some beliefs are justified, but not in virtue of standing in a certain relationship to other beliefs, thereby denying (R5) (Chisholm 1977; Annis 1977; Audi 1993; McGrew 1999; Audi 1983; Pollock 2001; K. Lehrer and Paxson 1969; Hobson 2008; Fumerton 1995)². Rather, these foundational beliefs serve as a source of justification for other beliefs, without needing further beliefs to be themselves justified. Coherentists hold that beliefs are justified in virtue of belonging to a coherent web or network of beliefs, thereby denying a modified version of (R4) (BonJour 1985; Davidson 1989; Kvanvig and Riggs 1992; Lehrer 1999; Quine and Ullian 1978). Less commonly, Infinitists hold that the structure of justificatory reasons is infinite and non-repeating, thereby denying (R3) (P. Klein 1998; P. Klein 1998; P. Klein 2003; P. Klein 2007; P. D. Klein 1999; P. D. Klein 2010).

Skeptical regress arguments lead, at best, to a limited form of skepticism, that is. propositional knowledge skepticism. Foundationalists, coherentists, and infinitists offer different attempts at blocking the inference to propositional knowledge skepticism, thereby offering accounts as to how we can “know that p.” Since these are accounts of how we can have a justified belief or knowledge that p, and since ‘p’ can take as its value

² Notably there are some foundationalists who hold that perceptions, or perceptual experiences can justify beliefs but are not themselves propositions. Still, these foundationalists can be taken to deny (R5) of the regress argument because they hold that some beliefs are justified in virtue of being a part of a terminating chain that terminates in a perceptual experience. However, it unclear how these perceptual experiences can stand in an inferential, or truth-preserving, relation to propositions since they do not seem to have propositional contents. One can, in some sense, infer propositions from perceptual experiences (or e.g., from pictures or models), but this is not logical inference, and leaves the nature of such inferences unclear, precisely because they have no account of the cognitive content of non-propositional representations.

all and only propositions, foundationalism, coherentism, and the like should be understood as accounts of the justificatory status of propositional knowledge, and only of propositional knowledge.

One exception to the focus on propositional knowledge is found in reliabilist accounts of knowledge (Bergmann 2006; Goldman 1979; Goldman 1976; Goldman 1988; Heller 1995; Nozick 1981; Goldman 1967). On a standard formulation, reliabilists hold that S knows that p if and only if S's belief that p was formed by a reliable process, that is, a belief forming process that, at least more often than not, leads to true beliefs. Under this formulation, reliabilism may appear to be restricted to propositional knowledge, just as the other views under discussion. But while reliabilism is typically stated in this manner, it needn't be.

Suppose that Bill knows what the Mona Lisa looks like, and that this knowledge consists in Bill's having a visual mental representation that corresponds to the appearance of the actual painting. While Bill may have certain beliefs about the Mona Lisa, in this example we are not concerned with explaining the epistemic status of Bill's beliefs. Rather, we are interested in accounting for Bill's knowledge of what the Mona Lisa looks like.³ Here, there is room for a reliabilist to hold that Bill's visual mental representation amounts to *knowledge* of what the Mona Lisa looks like because his visual representation was formed by a reliable process (viz. his visual system). Reliabilism does not require that Bill *believe* that a reliable process formed the representation, but only that the representation is the result of a reliable process.

³ "What the *Mona Lisa* looks like" may strike some as ambiguous. Are we concerned with what it looks like for an average human, to Bill, or something else? While these are interesting issues, the concern here is not with phenomenology. For present purposes, we could test whether Bill knows what the *Mona Lisa* looks like in the relevant sense by subjecting him to a recognition test.

Skeptical regress of reasons arguments, if they succeed, only establish that we have no *propositional* knowledge. Since these arguments attack the possibility of propositional knowledge, responses to these arguments generally amount to defenses of the possibility of propositional knowledge. Generally, these responses to skepticism amount to theories of what makes a belief justified (e.g. foundationalism, coherentism, infinitism, reliabilism, and so on).

1.2.2 THE GETTIER PROBLEM

Edmund Gettier's famous paper (1963) offers a counterexample to the traditional analysis of knowledge as justified true belief (JTB). This in itself should establish that the Gettier problem is a problem for the traditional account of *propositional* knowledge, but has nothing to say about other possible forms of knowing. Gettier presents cases in which subjects have a justified true belief, but intuitively, do not seem to have knowledge of the proposition in question. These "Gettier-intuitions" lend support to the following argument against the JTB analysis:

Gettier Argument

- (G1) If knowledge is JTB, then subjects in Gettier cases have knowledge.
- (G2) Subjects in Gettier cases do not have knowledge (Getttier-intuition).
- (G3) Therefore, knowledge is not JTB.

While little has been made of it explicitly, perhaps because it is so obvious, the JTB analysis is clearly an account of propositional knowledge. This comes across clearly in terms of the truth component. Since propositions, and only propositions, are the sorts

of things that can be true⁴, any account of knowledge with a truth requirement will be intrinsically limited to being an account of under what conditions we know propositions.

There have been two standard types of response to the Gettier problem. Some have proposed adding a fourth condition to the standard JTB analysis that prevents justified belief from being “gettierized.” Others have proposed strengthening the justification condition so as to maintain the JTB analysis without falling prey to Gettier’s counterexamples. The second option is committed to the highly unorthodox claim that justification entails certainty, that is, that we cannot have any justified *false* beliefs, and so subjects in Gettier cases do not have justified beliefs to begin with.

In response to these efforts, Linda Zagzebski has argued for “The inescapability of Gettier problems” (1994). Specifically, Zagzebski’s thesis is that no analysis of knowledge that is similar to the JTB account can avoid “gettierization,” so long as one allows justification and truth to come apart. For illustrative purposes, consider Alvin Plantinga’s (1996) attempt to avoid the Gettier problem by adding to the JTB analysis a fourth condition requiring that the subject’s faculties be working properly in an appropriate environment. Zagzebski in effect offers a recipe for constructing Gettier counterexamples to any JTB+X proposal, where X is offered as a means around these counterexamples. This recipe consists in two steps:

1. Start with a case where a subject has a justified false belief that also meets condition X.
2. Modify the case so that the belief is true merely by luck.

⁴ There is, of course, a sense in which beliefs and sentences have truth-values. But their truth-values are derivative on the relevant propositions. A belief is true if the believed proposition is true. A sentence is true if the proposition it expresses is true.

Against Plantiga's proposal, Zagzebski offers a case in which we imagine that Mary has eyesight that is good enough for her cognitive faculties to generally yield knowledge that her husband is sitting in the living room. But because these faculties are not infallible, we can imagine a case in which Mary's brother-in-law, who looks a good deal like her husband, is in the living room, and Mary concludes on the basis of her visual experience that her husband is in the room. Here, while Mary's belief is false, it appears to be justified. However, to create a Gettier case, we only need to alter the original such that Mary's husband just happens to be in the living room as well. Now Mary has a justified true belief, but still does not appear to know that her husband is in the living room, so much the worse for Plantiga's proposal, and other JTB+X accounts.

Another standard response to the Gettier problem is to maintain the JTB analysis, but strengthen the justification condition such that subjects in Gettier cases lack justification, and thereby knowledge (Merricks 1995; Sutton 2007; Littlejohn 2012). This effectively amounts to side stepping the issue as Gettier's cases are intended to constitute counterexamples to any JTB analysis that allows truth and justification to come apart. Those who strengthen the justification condition so as to block the Gettier counterexamples are committed to the highly unorthodox view that we can have no justified false beliefs. Given this entailment, the first step of Zagzebski's recipe cannot be undertaken. So while these positions offer a way of maintaining the JTB analysis in light of the Gettier problem, they do so at the cost of positing a controversial account of justification, one that seems to imply that knowledge is extremely rare in the sciences and ordinary life. In one accepts this conclusion, it would seem to follow that JTB is the concept of interest, not knowledge.

The Gettier problem seems to show that no amount of epistemic virtue (i.e. justification) is sufficient for yielding knowledge. Despite epistemologists' best efforts at getting around the problem, Zagzebski's discussion suggests that the only way to avoid the problem, while operating in the JTB tradition, is to strengthen the justification condition such that it guarantees knowledge, thereby violating standard epistemological orthodoxy.

Proposed solutions to the Gettier problem generally take the form of analyses of propositional knowledge or justified belief. The Gettier problem shows that the traditional JTB analysis is incorrect. Some address this problem by proposing a fourth necessary condition for propositional knowledge, a condition that allows us to distinguish cases of propositional knowledge from cases of mere justified true belief. Others address the problem by proposing analyses of justified belief, analyses according to which agents in Gettier cases are not justified in believing the propositions that they believe.

1.2.3 THE METHODOLOGY OF THE ANALYSIS PROBLEM

Whether one is concerned with skepticism of the Gettier problem, the methodology that epistemologists use to address the analysis problem has led to a narrow understanding of epistemic rationality. As I note at the end of section A., skeptical regress of reasons arguments attack the possibility of propositional knowledge. So, responses to these arguments amount to defenses of the possibility of propositional knowledge. At the end of section C., I note that the Gettier problem shows that the traditional JTB analysis of propositional knowledge is incorrect. So attempts to solve the Gettier problem consist in presenting analyses of propositional knowledge that

distinguish Gettier cases from cases of knowing propositions. Epistemologists have taken up a particular methodology to address both of these issues, which I discuss below. This methodology leads to an understanding of rationality that is quite narrow. So, in short, the focus on propositional knowledge has lead to this problematic understanding of rationality.

Epistemologists working on the analysis problem generally engage in a methodology that consists in working out the truth conditions of sentences that ascribe propositional knowledge of justified beliefs. One, for instance, proposes a theory of knowledge that fits the following schema:

Analysis schema-K: S knows that p if and only if j.

Here, j represents a list of necessary and sufficient conditions for S's knowing p. In other words, j represents proposed truth conditions for sentences of the form, "S knows that p." To determine if these proposed truth conditions are correct, epistemologists develop thought experiments in which the conditions represented by j are met. Then, epistemologists consult their intuitions to determine whether S actually knows that p in the case described. After enough intuitions are elicited, and any necessary adjustments are made to j, a theory of knowledge is proposed.

The same points apply when we are concerned with justified belief. One could, for instance, propose a theory of justified belief that fits the following schema:

Analysis schema-J: S is justified in believing that p if and only if j.

Here, j represents a list of necessary and sufficient conditions for S's being justified in believing that p. That is, j represents proposed truth conditions for sentences of the form,

“S is justified in believing that p.” Such a proposal is evaluated using the same methodology as a proposed theory of propositional knowledge.

While this methodology is problematic in its own right, as I argue in chapter 2 and 3, it has also lead to an understanding of rationality within epistemology that has a very limited applicability. I now turn to discuss the limitations and of this understanding of rationality.

1.3 EPISTEMOLOGY’S UNDERSTANDING OF RATIONALITY

Rationality amounts to epistemic constraint satisfaction. In other words, an agent is rational insofar as she satisfies her epistemic constraints. Epistemic constraints provide norms by which we can evaluate agents for good or correct performance. Good or correct performance must, of course, be understood relative to a particular goal, or set of goals.

Analysis schema-K offers norms for evaluating agents in pursuit of the goal of propositional knowledge. Analysis schema-J offers norms for evaluating agents in pursuit of the goal of justified beliefs. Since the point of forming justified beliefs is to have beliefs that are true and avoid having beliefs that are false, we can understand both analysis schemas as providing norms that must be satisfied when one’s goal is acquiring true beliefs. Because these norms amount to epistemic constraints, and an agent is rational insofar as she satisfies her epistemic constraints, the methodology of the analysis problem leads to an understanding of rationality in which rationality amounts to behaving in a way that is conducive to forming true beliefs. I will use the term *truth-directed rationality* to refer to this understanding of rationality.

The norms of truth-directed rationality may indeed offer resources for evaluating an agent's rationality when that agent has the goal of acquiring true beliefs, but it is important to note that such an understanding of rationality is quite limited in its applicability. When our goals are appropriate, it may be the case that forming beliefs in accord with the norms of truth-directed rationality is the rational thing to do. But it is not the case that these norms provide the appropriate criteria for evaluating agents for rationality in any general sense.

One limit of truth-directed rationality is that it fails to provide norms of rationality for evaluating agents who are not operating in the pursuit of truth. Standards of truth-directed rationality are used to assess strategies and procedures in terms of their tendency to lead to true beliefs. One such standard is to form beliefs on the basis of complete evidence. Among contemporary epistemologists, evidence is understood as taking a propositional or linguistic form. Williamson (2000), for instance holds that one's evidence consists in the totality of propositions that one knows. Conee and Feldman (2004) hold that one's evidence consists in the occurrent thoughts that one is having at a particular time.⁵ If evidence takes this linguistic or propositional form, then forming beliefs on the basis of one's evidence requires forming beliefs through a process of logical inference. In other words, one prescription of truth-directed rationality is to form beliefs by making inferences from one's evidence.

But there are many contexts in which our goal is not to acquire true beliefs, and to achieve these goals we rely on non-linguistic representations. The cab driver relies on his mental map to navigate about the city. The barber relies on the stock photo to give his

⁵ Notably, this way of thinking about evidence is a more recent development. Russell, for instance, held that evidence is sense data. Quine held that evidence consists in stimulations of one's sensory receptors.

client the desired hairstyle. While maps and photographs can be assessed in terms of how accurately they represent their targets, they cannot be assessed for truth or falsity.⁶ So truth-directed standards of rationality seem to be inapplicable to circumstances in which our aims are not truth-directed.

A second limit to truth-directed rationality is that its standards generally cannot even be applied to agents who are pursuing true beliefs. This is because these standards are typically formulated in hypothetical, idealized conditions that abstract away from various real world constraints to which we are constantly subject. For example, in considering how an ideal agent might approach a given scenario, one might set aside concerns pertaining to temporal deadlines or the limits of human memory. While standards formulated under such conditions may be appropriate for entities that are not subject to these kinds of constraints, or who are operating under circumstances in which these constraints do not arise or are mitigated by design, we are clearly not entities of this sort. Rather, we are finite creatures with a fixed cognitive architecture. Since “ought” implies “can”, the standards of rationality to which we are subject must be sensitive to the limits of our cognitive capabilities. I call this the *ought-can principle*. Standards of truth-directed rationality violate this principle when applied to human individuals, and thereby cannot serve as an appropriate guide for evaluating human individuals for rational behavior.

⁶ A complication arises from the fact that pictures, for example, represent many things. Unlike sentences, images cannot single out particular properties of objects. However, due to the way in which cognition works, we have the capacity to attend to particular features of images. This capacity may be required for us to assess the degree to which an image, or other non-propositional representation, accurately represents its target. This capacity also enables us to have beliefs that are constituted by images. Beliefs, of course, have truth-values. But it is important to note that in these cases, it is the *belief* that has a truth-value, not the images that comprise the belief.

A normative theory of rationality should evaluate performance, practice, and strategies in light of what is likely or possible. In idealized, time constraint free circumstances, a rational strategy may be to wait for complete information before choosing between alternatives. In the real world, such a strategy could not only be irrational, but also deadly. If, for instance, one waits to be sure that the approaching light is an oncoming car before deciding to step out of the path, one may end up dead before complete information becomes accessible. In different real world circumstances, the same strategy may be impossible or different strategies may be required, simply because circumstances and our cognitive limits do not allow us to possess or contemplate complete information.

One might acknowledge that in certain circumstances, we may have good practical reasons for violating standards of truth-directed rationality. However, one might go on to think that this just shows that in *some*, perhaps limited, cases these standards do not apply.⁷ But most of the time, when we are not under looming deadlines, or when we aren't dealing with something so complex so as to be computationally intractable, this is not the case, and so my point, while a good one, is quite narrow.

This response suffers from two problems. First, the point I'm pushing is not just the obvious one that there are instances that constitute exceptions to the standards of truth-directed rationality. Clearly the constraints to which we are subject come in various degrees of stringency and leniency, and perhaps under the more lenient circumstances we can come closer to approximating that which truth-directed rationality prescribes. If you

⁷ Alternatively, one might hold that the norms of truth-directed rationality do hold in most, or all cases. This has the result that what is actually limited are the circumstances in which we can satisfy these norms and acquire knowledge. Of course, if there are no circumstances in which we can satisfy these norms, we seem to be on the road to skepticism. If this is the case, then there is no knowledge, and perhaps we just have to get by with various degrees of justification.

have three years to solve a problem, then you can come closer to gathering all of the relevant information than you could if you had three weeks to solve the same problem.

But, although sometimes the constraints to which we are subject are more lenient than others, we can never free ourselves from them. A deadline in three years is still a deadline. We do often attempt to alleviate these constraints to the extent to which this is possible, particularly in theoretical pursuits. But we often do this by institutionalizing research programs to circumvent the temporal constraints inherent in our mortal status. Doing this also allows us to bolster our capacities for computation and memory, as does the development of various instruments and media for the storage of information. Although institutions are still subject to constraints of various sorts, they may represent the closest we can come to reaching ideal conditions for pure theorizing.

One might think that we can circumvent this issue by developing practical standards of rationality that are based on the truth-directed standards developed in epistemology. This response assumes that we can arrive at a constrained, and thereby practical, account of rationality by beginning with an idealized, truth-directed account, and then imposing practical constraints. In mechanics, for instance, the ideal pendulum law idealizes away from friction and air resistance, modeling a pendulum's behavior in such an environment. This is unproblematic because there is actually a way that a pendulum would behave in such circumstances. In contrast, we cannot idealize away from length or gravity because there is no way a pendulum would behave absent these factors because eliminating these factors eliminates the pendulum. Standards of truth-directed rationality treat real world constraints as being of a piece with friction and air resistance. This is a mistaken assumption. The ideal pendulum law is useful because it

allows us to determine how friction and air resistance would modify the behavior of an ideal pendulum. In other words the ideal pendulum law allows us to approximate how a non-ideal pendulum would behave. The same does not hold true when we are concerned with cognitive systems or strategies. Effective cognitive strategies are generally designed to be effective within specific circumstances having their own unique sets of constraints. So an ideally rational cognitive system will not simply work *non-ideally* upon the imposition of constraints. Generally, such a system will cease to work at all.⁸ For instance, in an environment without temporal constraints, serial search may be the most effective strategy for arriving at the best answer. But if a system that uses serial search is transported into a temporally constrained environment, the system may run out of time before coming to the right answer. It has no way of making a best guess. Unless the system has some sort of ad hoc programming (programming that would be unnecessary in the temporal constraint free environment in which it was designed), it will do nothing. Similar problems arise when we are concerned with memory rather than time. When a finite system runs out of memory, it crashes. This is what happens when calculators give an “e” message to indicate error.

Moreover variation in performance is not simply a function of resource availability. Two systems with the exact same resources may differ in terms of problem solving performance depending on which algorithm is used to search memory. If one system is using breadth-first search while the other uses depth-first, then each systems’ performance will depend on the location of the relevant information within the search

⁸ For further elaboration and discussion of these points see (Cummins, Poirier, and Roth 2004).

tree. While this problem is generally acknowledged in AI research, it has been neglected in epistemology.

The second problem with the response – namely, that it is only in limited circumstances that the standards of truth-directed rationality do not apply – is that it appears to assume that acquiring true beliefs is the primary aim of rational agents. In other words, rational agents are rational in virtue of adhering to normative standards of truth-directed rationality because doing so typically results in the formation of beliefs that are justified in virtue of according with one's evidence.

Nevertheless, this claim ignores the fact that activities that have the appearance of being purely truth-directed are usually conducted in the service of action or practice. In these cases, our reasoning isn't purely in the pursuit of truth, but rather, a means of accomplishing various practical ends. When reasoning is done in the service of practice, rather than in the service of truth, it should be evaluated, not in terms of its truth conduciveness, but in terms of how effectively it serves the action with which we're concerned. For these reasons, the epistemic constraints that must be satisfied for a belief to be knowledge will often differ from the epistemic constraints that must be satisfied for a belief to be rational. A predator detection system, assessed in terms of truth-directed rationality, is rational so long as it typically classifies predators, and only predators, as predators. However, predator detection systems, like many real world cognitive systems, have temporal and computational constraints built-in. The goal, at least generally, of a predator detection system is to avoid predators. For this reason, real world predator detection systems are extremely sensitive and generate many false positives. While truth-directed standards of rationality would judge such a system to be irrational, the strategy

is, practically speaking, very rational. Simply put, a practically rational predator detection system will exchange accuracy for speed (see Cummins, Poirier, and Roth 2004).⁹

Or consider, for example, physics. When we are concerned with purely truth-directed theorizing, it would be objectionable to invoke Newtonian mechanics as the basis for some claim. On the other hand, when NASA's goal is to calculate escape velocities, they quite rationally use Newtonian mechanics to do so. While we no longer hold that Newtonian mechanics is the correct mechanics, it does a better job serving the action of calculating escape velocities than does relativity or string theory. Using the latter would make the computations intractable, leading to a greater possibility of error and less success at launching projectiles beyond Earth's gravitational field.

It appears, then, that truth-directed standards of rationality have very little real world application. The world is full of finite epistemic agents that are subject to various constraints. Moreover, these agents have many non-truth directed goals. In order to give these agents their epistemic due, we are in need of an epistemological framework that can accommodate practical limitations and non-truth-directed goals.

1.4 PHILOSOPHICAL ACCOUNTS OF PRACTICAL RATIONALITY

In the previous section, I suggested that philosophical discussions of rationality amount to discussions of truth-directed rationality. This portrayal may appear to neglect philosophical discussions in which practical considerations are given their proper due. In

⁹ To use more standard epistemic terms, we might also say that the system exchanges knowledge for effectiveness.

this section and the two that follow, I review a few of these approaches, and argue that they fall short.

1.4.1 PRAGMATIC ENCROACHMENT AND CONTEXTUALISM

Recently some epistemologists have made efforts to account for practical or pragmatic considerations in offering accounts of knowledge. In their discussion of “pragmatic encroachment,” Fantl and McGrath (2007) argue that knowledge is not purely epistemic, but rather, there is a pragmatic condition on knowing. Specifically, they claim that if S knows that p, then S is rational to act as if p.

To motivate the position, Fantl and McGrath appeal to the standard practice of defending or criticizing actions by citing knowledge. Consider a couple of their examples:

I might say to my spouse, in defending my driving straight home without stopping off to get yams the night before Thanksgiving, ‘I know we have them at home.’ In citing my knowledge, I am trying to convince my spouse that I am rational to act as if we have yams at home – that is, head home rather than stop off and buy some (Fantl and McGrath 2007, 561).

I knew they [the doors] were locked; why did I bother going back [to check]? (Fantl and McGrath 2007, 562)

While Fantl and McGrath present their view as an account of knowledge that is sensitive to pragmatic considerations, these examples suggest that the opposite is the case. In the first example, the subject appeals to his knowing that there were yams at home as evidence for the rationality of his not stopping to get some on the way home. Rather than imposing a pragmatic condition on knowledge, this seems to be the imposition of an epistemic condition on a practical affair. *Because* the subject *knew* there were yams at home, it was rational for him to come straight home. In the second example, *because* I

knew the doors were locked, it was irrational for me to go back to check. If pragmatic considerations “encroach” upon epistemological considerations, then it seems that what we ought to do should affect what we know. But in Fantl and McGrath’s examples the opposite seems to be the case. That is, what we know affects what we ought to do.

In the first example Fantl and McGrath assume that the subject acted rationally, and that in the second, that she acted irrationally. It is far from clear that these assumptions are correct. In the first case, we could imagine the husband reasoning, quite rationally, “I know there are yams at home, but since the store will be closed tomorrow, I’d better go pick some up just to be safe.” Similarly, in the second case one might think, “I know I locked the door, but it would be disastrous if my valuables were stolen, so I’d better go back to make sure.” If Fantl and McGrath are correct, then either these individuals are acting irrationally, or they do not know what they claim to know. In other words, for Fantl and McGrath one cannot both know that *p* and rationally act as if not-*p* is the case.

But unless one thinks that knowledge entails certainty, there are surely cases in which one can know *p* and rationally act as though not-*p*. I can know that the door is locked on the basis of having locked it a few minutes ago. But in this context I can also rationally act as though this is not the case by going back to check.

Similarly epistemic contextualism may be seen as an attempt to make our epistemic concerns sensitive to practical affairs. Contextualism is the view that the truth-conditions of knowledge-attributing and knowledge-denying sentences may vary across the contexts in which they are uttered. Keith DeRose (2009), for instance appeals to judgments arising from the considerations of pairs of cases, one in which the costs of

being wrong are high (i.e. a high stakes case) and one in which the costs of being wrong are low (i.e. a low stakes case). In both contexts, the subject is in the same epistemic position with regard to her evidence and justification for believing a proposition. However, contextualists hold that in the low stakes case the subject knows the proposition, whereas in high stakes case, she does not. Since subjects in both cases stand in the same epistemic position with regard to the same proposition, contextualists explain the epistemic asymmetry in terms of different standards that must be met for a proposition to be known. DeRose believes that in considering these pairs of cases ordinary speakers will have the intuition both that speakers in the cases are speaking appropriately, and that they are speaking truthfully in attributing or denying knowledge to some subject.

Contextualists appear to do a better job attempting to accommodate practical considerations than Fantl and McGrath's pragmatic encroachment account. Whereas Fantl and McGrath seem to impose standards of truth-directed rationality onto practical considerations, contextualists like DeRose at least seem open to adjusting our epistemic standards in light of practical issues. While I am sympathetic to the contextualist attempts to posit epistemic sensitivity to practical matters, I believe that this sensitivity should take a different form. Contextualism is ultimately wedded to the propositional framework that is standard in epistemology. I offer what I take to be a better approach in chapter 3.

1.4.2 PRACTICAL RATIONALITY IN ETHICS

Another area in which practical rationality has received direct attention is in ethics. However, these discussions typically amount to reducing practical rationality to

truth-directed rationality. In other words, what we ought to do is held to be determined by what we know, or what we ought to believe.

Derek Parfit, for instance, has argued that metaphysical considerations surrounding the nature of personal identity should have important implications for our views about both rationality and morality (1984). The details of Parfit's views on personal identity are not relevant to the present discussion. However, Parfit motivates his position by appealing to thought experiments that abstract away from real world constraints to which we are always subject. This methodology may be fine and well for investigating the metaphysics of personal identity. But nevertheless, considerations that arise from contemplating such an abstract environment should have no bearing on how we think about rationality in our world.

As Christine Korsgaard notes, because we have a practical need to make deliberative choices, that is, choices about what to do, we have a further need to identify with a unified principle or way of making them. "It is practical reason that requires me to construct an identity for myself; whether metaphysics is to guide me in this or not is an open question," (Korsgaard 1989, 112). Whatever we may be justified in believing about the metaphysics of personal identity from a truth-directed standpoint is independent of what we ought to do from a practical standpoint. From the practical standpoint, the very need to act or do anything requires that we reconcile any conflicting desires or plans that we might have. As Korsgaard puts it, "there is the raw necessity of eliminating conflict among your various motives," (1989, 110).

Elsewhere, Rawls assumes that agents in his "original position" have no time preferences because avoiding such preferences is a feature of individual rationality.

Following Sidgwick, Rawls writes, “The mere difference of location in time, of something’s being earlier or later, is not in itself a rational ground for having more or less regard for it,” (1999, 259). He acknowledges that we may have rational grounds for more heavily weighting present or future benefits due to their greater certainty or probability. However, setting aside these epistemic matters, his view is that differences in time alone should not be taken into account if we are to have rational preferences.

Perhaps if we found ourselves in circumstances where temporal remoteness did not go hand in hand with decreased certainty, then it would not be rational to place greater weight on the here and now. However, it seems likely that for the foreseeable future, at least, temporal distance will correlate with uncertainty. Given that this is the situation in which we live, norms of rationality should account for epistemic uncertainty when considering preferences across time. To ask how a fully rational agent would value preferences across time in the absence of uncertainty has no bearing on how, given our situation, we ought to value preferences across time.

Generally, the method of determining how an ideally rational being would behave in circumstances that abstract away from real world constraints falsely assumes that increases in idealization amount to increases in rationality. This is, essentially, the same strategy that was considered above in section III.B., namely, the idea that we can arrive at constrained, and thereby practical, accounts of rationality by beginning with an idealized, truth-directed account, and then imposing practical constraints. As I argued above, effective cognitive strategies are generally designed to be effective within specific circumstances having their own unique sets of constraints. So an ideally rational cognitive system will not simply work *non-ideally* upon the imposition of constraints.

Rather the system will cease to work at all. The limits of memory make reasoning in the absence of uncertainty impossible from the practical standpoint. An idealized system will crash upon the imposition of memory constraints. It will, effectively, display a calculator's error "e."

If our concern is with practical, rather than truth-directed, norms of rationality, then it is unclear what we should gain from thinking about the behavior of an ideally rational agent in idealized circumstances, given the false assumption that underlies this approach. Norms of practical rationality should amount to norms of rationality that are applicable to human beings. Thinking about ideally rational systems cannot provide us with norms of rationality that are practical in any serious sense.

1.4.3 BAYESIAN APPROACHES TO PRACTICAL RATIONALITY

Finally, there is some attention to practical rationality among Bayesians. Bayesians offer an account of how one's subjective degree of belief should be rationally updated in light of evidence. To do this, Bayesians requires that we conditionalize on prior beliefs. To estimate the probability of some event e , given the evidence, requires that we know the prior probability of e , that is, the probability of e without the evidence under consideration. However, a problem emerges when we consider how the prior probability of e ought to be estimated, given that the prior probability should depend on everything we know about e . Because, in principle, anything can be taken as evidence for anything else if we have the appropriate connecting beliefs and inferences, it seems that estimating the prior probability requires that we take everything into account.

In light of this issue, there is a case to be made for using simple heuristics rather than a Bayesian approach (see Gigerenzer and Todd 1999). Given our various resource constraints, when our concern is with practical rationality, we cannot idealize away from essential features of the problem under consideration. If one is faced with a problem that requires a quick decision (e.g. should I step out of the way of what appears to be an approaching headlight?), a non-Bayesian approach will be more effective, i.e., practically rational. While false positives are bound to occur when using simple heuristics (e.g. stepping aside only to discover the apparently approaching light was not in fact approaching), using a strategy that is truth-aimed, or a strategy that requires assessing totally evidence, will be cognitively expensive, intractable, and ineffective.

1.5 KNOW-HOW: TAKING PRACTICAL RATIONALITY SERIOUSLY

One exception to the widespread narrow focus on truth-directed rationality comes in discussion of knowledge-*how*. Since, and perhaps due to the influence of, Gilbert Ryle many philosophers and cognitive scientists have taken know-how to be importantly distinct from propositional knowledge. While propositional knowledge is truth-directed, know-how consists in certain abilities, skills, or dispositions.

In traditional epistemology, much effort has been put into analyzing the concept of propositional knowledge. These analyses are aimed at determining the conditions under which propositional knowledge ascriptions are true (S knows that p iff...). However, cognitive scientists and many philosophers that have studied know-how have generally been concerned, not with truth conditions of know-how ascriptions, but with understanding what sort of functional analysis is required to explain various skills and

abilities. Typically these explanations amount to an account of the cognitive architecture necessary for carrying out a certain task, or exercising an ability. Jerry Fodor nicely captures the spirit of this research program, holding that X-ing behavior is to be explained in terms of having representations that answer the question, “How does one X?” and a suitable cognitive architecture for exploiting these representations in a way that results in X-ing.

While Fodor holds that the representations are linguistic, in accord with his LOT hypothesis, one could just as well propose a non-linguistic account. For instance, Paul Churchland holds that a golfer’s golf swing know-how consists in his motor representation of a golf swing. John Haugeland holds that a system’s knowledge of how to play ping-pong is contained in the weights between the nodes in the system’s neural network. Bechtel and Abrahamsen identify know-how with partitioned activation spaces.

Seen in this way, the know-how literature creates space for an epistemic role for non-linguistic representational formats. This, in turn, opens up space for cognitive, yet epistemic, activities that are not assessable in terms of standard truth-directed rationality.

1.6 EPISTEMOLOGY AND COGNITION

The discussion of know-how in the previous section illustrates two well-developed approaches to understanding epistemic cognition. On the one hand, Fodorian views hold that epistemic cognition is structured in accordance with the LOT hypothesis. Eliminativist materialist views, on the other hand hold that cognition is to be understood in terms of connection weights or partitioned activation spaces. In this dissertation, I propose to understand epistemic cognition in a way that fits between these two extremes.

In other words, I believe a proper understanding of epistemic cognition is not limited purely to propositional attitudes or a LOT, but such an understanding does not require moving to the extreme of eliminativist materialism.

My proposal, following Cummins et al. (2013) draws on four assumptions:

A. Representational Theory of Content: If Φ is the content of some mental state M of S, then M consists in part of a representation R whose content is Φ .

B. Representational Pluralism: There are multiple representational schemes, each with their proprietary content types and representational targets. These are generally not inter-translatable. Most of these are non-propositional in the sense that they are not candidates for truth-conditional semantics.¹⁰

C. Psychological Representational Pluralism: The mind employs multiple representational schemes. These are generally not inter-translatable.

D. Epistemological Representational Pluralism: A great deal of knowledge involves the exploitation of a diversity of representational schemes, both internal and external. (Cummins et al, 2-3¹¹)

While there are certainly those who reject A, I take it to be a relatively uncontroversial assumption. Those who reject the representational theory of content (Brooks 1991; Van Gelder 1998; Van Gelder 1997) do so because they are opposed to appealing to content to explain the workings of the mind (Cummins et al. 2013). In this project, my primary aim is to establish a middle ground between proposition-based folk psychology and eliminative materialism, both which appeal to content in their own ways.

¹⁰ See Haugeland (1991), Cummins (2010) for discussion of theses of this sort. Also see Cummins et al (under review).

¹¹ Page numbers taken from “online first” version of the article.

Assumption B claims that there are a variety of representational schemes. While this point seems to be overlooked in much of philosophy, for instance the theory of knowledge, it should not be controversial. While we can use language to describe a picture, and draw a picture based on a linguistic description, information is lost in the move from one format to the other, and so these actions should not be understood as information preserving translations. Assumption C is closely related, claiming that the mind employs a variety of representational schemes. While we can, and often do, for example, form propositional attitudes such as beliefs on the basis of visual perceptions, to visually perceive something is not the same as forming a belief in a proposition (Cummins et al. 2013, 2-4).

Assumption D is the most controversial. Combined with the first three assumptions, D leads to the conclusion that we have non-propositional knowledge. For instance, we may have knowledge the contents of which are represented through images or models, and this knowledge cannot be linguistically expressed (Cummins et al. 2013, 4). If we have a good deal of non-propositional knowledge, then traditional epistemic concepts such as justification, truth, and belief may not hold the same level of importance that they are typically given. Moreover, new concepts may emerge as epistemically significant that have not received much, if any, attention from mainstream epistemologists, such as accuracy and effectiveness.

In the next chapter, using know-how as a sort of case study, I will argue that our understanding of the structure of knowledge must be sensitive to the way in which we represent information. This constraint will still allow for a good deal of propositional knowledge. We have the capacity to mentally represent propositions, and if other

appropriate conditions are met, then some of these propositional representations will constitute cases of knowing. At the same time, this constraint plays a liberalizing role, in opening up space for other types of mental representations to constitute instances of knowing as well.

1.7 CONCLUSION

In this chapter I have argued that epistemology needs to be broadened in a way that allows it to accommodate non-propositional knowledge. I have argued that one consequence of such a broadening is that we must revise the way in which we understand epistemic rationality. The standard way of understanding rationality in epistemology, that is, truth-directed rationality, arose as a result of focus on the analysis problem and the methodology developed to address the problem. If we are engaged in the project of providing necessary and sufficient conditions for propositional knowledge or justified belief, that is, providing epistemic constraints that must be satisfied by an agent pursuing true beliefs, then we will naturally fall into a truth-directed understanding of rationality. But if epistemology is broadened so as to focus on epistemic issues that are independent of the analysis problem, then we must broaden or modify our understanding of epistemic rationality as well.

CHAPTER 2

KNOW-HOW AND NON-PROPOSITIONAL KNOWLEDGE

2.1 INTRODUCTION

Intellectualism is the view that knowing how to do something amounts to knowing that something is the case. *Anti-intellectualism* is the view that knowing how consists in dispositions or abilities. In this chapter I offer arguments against two versions of intellectualism. Stanley and Williamson (2001) hold that propositional knowledge is both necessary and sufficient for know-how. Against their view, I argue that there are cases in which such knowledge is insufficient. Bengson and Moffett (2012) argue that propositional knowledge is necessary, but not sufficient for know-how. Rather, they hold that knowing how requires meeting a further condition, namely, standing in a non-propositional knowledge of relation to a way of doing something. Against this view, I argue that if propositional knowledge is necessary for know-how, then we must deny that many clear instances of know-how are in fact such instances. Taken together, my cases against Stanley and Williamson and Bengson and Moffett show that propositional knowledge is neither necessary nor sufficient for know-how.

2.2 STANLEY AND WILLIAMSON ON KNOW-HOW

S&W offer the following account of know-how:

S knows how to X if and only if (i) for some way w , S knows that w is a way for her to X and (ii) S entertains the proposition ascribed in (i) under a *practical mode of presentation* (hereafter, PMP).

To establish that (i) is a necessary condition for know-how, S&W appeal to Lauri Karttunen's (1977) account according to which embedded questions denote the sets of their true answers. Consider some examples from Stanley (2011, 209):

- (a) John knows where to find coffee in New York City.
- (b) John knows why to find coffee in New York City.¹²
- (c) John knows when to find coffee in New York City.
- (d) John knows how to find coffee in New York City.

These sentences involve the verb “know”, and an embedded question (e.g. Where does one find coffee in New York City?) that consists of a question word (e.g. “where”) and an infinitive (“to find coffee in New York City.”).

On Karttunen's analysis, (a) has a reading according to which it is true if and only if for all places *p* that are places where John can find coffee in New York City, John knows that *p* is a place at which he can find coffee in New York City. However, Stanley and Williamson deviate from this element of Karttunen's view, holding that, in (a) for instance, John must only know that *some* place *p* is a place where he can find coffee in New York City.

Stanley suggests that (a) has a natural reading according to which it is true if and only if there is a place *p* that is a place where John can find coffee in New York City, and John knows that *p* is a place where he can find coffee in New York City. In other words, (a) can be taken to mean that there is place that is such that John knows that it's a place at which he can find coffee. To generalize, (b)-(d) have synonymous readings:

- (a*) For some place *p*, John knows that he can find coffee in New York City.
- (b*) For some reason *r*, John knows that he can find coffee in New York City for reason *r*.
- (c*) For some time *t*, John knows that he can find coffee in New York City at time *t*.
- (d*) For some way *w*, John knows that he can find coffee in New York City in way *w*.

¹² While the syntax of this expression is odd, it is included in Stanley's analysis as he takes it to be a part of the class of “knows-wh” expressions.

Stanley takes it to be intuitively obvious that (a)-(c) have the readings given in (a*)-(c*) which provides reason for holding that (d) is naturally read as expressing (d*)

However, S&W suggest that while knowing that *w* is a way for one to *X* is necessary for know-how, it is not sufficient. Consider:

(1) Hannah knows how to ride a bicycle.¹³

(2) Hannah knows that *w* is a way for her to ride a bicycle.

S&W note that there are cases where (2) is true and (1) is false. Consider the following, adapted from S&W (2001, 428–429):

Bicycle 1: Suppose that Hannah does not know how to ride a bicycle. Susan points to John, who is riding a bicycle, and says, 'That is a way for you to ride a bicycle'. Suppose that the way in which John is riding his bicycle is in fact a way for Hannah to ride a bicycle.

Here, S&W claim that, in the case when the demonstrative 'that' denotes John's way of riding a bicycle, this constitutes an instance in which (2) is true, but (1) is false.

According to S&W, both (1) and (2) ascribe to Hannah the same propositional knowledge. However, (1) and (2) differ in that they ascribe knowledge of the proposition under different modes of presentation. While (1) ascribes knowledge of the proposition under a *practical mode of presentation*, (2) ascribes knowledge of the proposition under a *demonstrative mode of presentation*.

S&W explain practical and demonstrative modes of presentation by comparing them with *first-personal modes of presentation*. To provide an example of a first-personal

¹³ Strictly speaking, (1) is treated as "Hannah knows how PRO to ride a bicycle." (S&W 424–425). 'PRO' is an empty pronominal element that occurs in the subject position of infinitives in English. As S&W discuss, there are other interpretations of 'PRO' and the infinitive "to ride a bicycle" available. However, for our purposes the relevant interpretation is one in which 'PRO' receives its interpretation from 'Hannah' and the infinitive is interpreted as having 'can'-like, rather than 'ought'-like force. For these reasons, (1) can also be read as "Hannah knows how she could ride a bicycle."

mode of presentation, they ask us to suppose that John looks in a mirror, which he mistakenly believes to be a window, and sees a man whose pants are on fire. John, failing to recognize the man as himself, forms what S&W call a “demonstrative belief” that the man has burning pants. Although the man has burning pants, and John is in fact the man, he does not seem to believe that he himself has burning pants. In this context, then, (3) seems true whereas (4) seems false (Stanley and Williamson 2001, 428):

(3) John believes that that man has burning pants.

(4) John believes that he himself has burning pants.

Since “that man” and “he himself” refer to John, the complement clauses of “that” in (3) and (4) express the same proposition.¹⁴ However, the notion of different modes of presentation under which propositions can be entertained provides a way of distinguishing (3) and (4). In (3), John is entertaining a proposition under a demonstrative mode of presentation, while in (4) he is entertaining the very same proposition under a first-personal mode of presentation. S&W suggest that there is a conventional connection between pronouns such as ‘he himself’ and first-personal modes of presentation, and that this conventional connection provides additional information about how subjects of ascriptions think about the propositions being ascribed. This allows us to predict how these subjects will behave in various circumstances. For instance, thinking of a person as oneself, or thinking of a place as *here*, entails being disposed to behave in certain ways. Yet first person thought, S&W claim, is genuinely propositional. It is just the case that the possession of certain kinds of propositional knowledge is related to having certain dispositions.

¹⁴ Here, we are operating on the assumption that modes of presentation are not semantically relevant.

S&W hold that, like (3) and (4), (1) and (2) express the same propositions. Just as we could with (3) and (4), we can explain the intuitive differences between (1) and (2) by appealing to distinct modes of presentation. Moreover, S&W posit a conventional connection between expressions that embed instances of the schema ‘how to X,’ and practical modes of presentations of ways. Moreover, they hold that thinking of a way under a practical mode of presentation entails having certain dispositions (Stanley and Williamson 2001, 429). On their view, this provides a way to explain a connection, which they grant, between know-how and dispositional states, without having to posit non-propositional knowledge.

2.3 AGAINST STANLEY AND WILLIAMSON

In this section, I argue that satisfying S&W’s condition (b) requires non-propositional knowledge. If satisfying condition (b) is necessary for knowing-how, and satisfying this condition requires non-propositional knowledge, then knowing-how requires non-propositional knowledge, contrary to S&W’s claim that propositional knowledge is both necessary and sufficient for knowing-how. My case against S&W rests on theoretical background that was presented in section VI of chapter 1. Here, before proceeding, I briefly review this theoretical background.

2.3.1 THEORETICAL BACKGROUND

In “Why it doesn’t matter to metaphysics what Mary learns,” Cummins et al. (2013) draw on four assumptions to argue that Frank Jackson’s Mary does indeed learn something new when she sees red for the first time, but that this epistemic gain is

orthogonal to physicalism and phenomenology. Here, my aim is to show that the theoretical background that underlies Cummins et al.'s position renders S&W's account of know-how implausible, in so far as it is an intellectualist position.

Cummins et al begin their account by introducing the following assumptions (2013, 2-3¹⁵):

(A) *Representational theory of content*: If Φ is the content of some mental state M of S, then M consists in part of a representation R whose content is Φ .

(B) *Representational pluralism*: There are multiple representational schemes, each with their proprietary content types and representational targets. These are generally not inter-translatable. Most of these are non-propositional in the sense that they are not candidates for truth-conditional semantics.¹⁶

(C) *Psychological representational pluralism*: The mind employs multiple representational schemes. These are generally not inter-translatable.

(D) *Epistemological representational pluralism*: A great deal of knowledge involves the exploitation of a diversity of representational schemes, both internal and external.

Cummins et al suggests that (A) is relatively uncontroversial in the context of the knowledge argument, and I take it that it is equally non-controversial here (2013, 3). As they acknowledge, some do reject the representational theory of content (Brooks 1991; van Gelder 1998). But philosophers of this type usually reject the theory as a means of understanding the mind or brain. I take it that such an option will not appeal to S&W or other advocates of intellectualism.

Assumption (B) claims that content can be represented in a variety of formats, many of which are non-linguistic or non-propositional. We can, of course, construct a representation in one format on the basis of a representation in another. Police sketch

¹⁵ Page numbers taken from "online first" version of the article.

¹⁶ See Haugeland (1991), Heck (2007), Fodor (2007), and Cummins (2010) for sustained defenses of theses along these lines.

artists, for instance, create drawings on the basis of linguistic descriptions. Nevertheless, this is not a translation. The same point applies to other non-linguistic representations such as maps, models, partitioned activation spaces, and audio recordings. From this point it follows that we cannot express the content of a non-linguistic representation in language.

A common objection to this assumption is that pictures can be symbolically encoded as pairs of gray-scale and position values. But as Cummins et al. note, a symbolic encoding of a picture does not depict anything. The semantics of the picture do not overlap with the semantics of its symbolic encoding. A picture is about what it depicts while a symbolic encoding is about gray-scale and position pairs. Moreover, symbolic and pictorial representational schemes are processed quite differently. While we can easily process images, we need a computer with the appropriate software to process its symbolic encoding. Moreover, we can easily determine that two different pictures of the same individual are pictures of the same individual. This is far more difficult for a system that only has the symbolic encoding (Cummins et al. 2013, 3).

Assumption (C) is simply the claim that the mind employs representational schemes as diverse as those discussed under (B). As Kant observed, percepts are not, and do not translate into, propositional thoughts (Cummins et al. 2013, 4). We often express the fact that visual percepts, for instance, allow us to infer propositions by saying things like, “I *see* that the cat is on the mat.” Though language can be misleading in this respect, visual percepts, like pictures, are depictive representations that do not express propositions. The same point applies to other non-linguistic representations, such as maps, graphs, and models. They are all representations and none of them express

propositions. Hence, they cannot be evaluated by truth-conditional semantics. Rather, they must be assessed for accuracy, often along competing dimensions.

Assumption (D), as stated, should be fairly non-controversial. We clearly acquire knowledge through visual perception, linguistic testimony, consulting maps, and studying diagrams. A good deal of this knowledge is propositional. Nevertheless, assumption (D), when combined with (A) through (C) opens up the possibility that we have non-propositional knowledge as well, for instance, when we exploit representations whose contents cannot be linguistically represented and come to know these contents. We can, for instance, know the layout of the New York subway system in virtue of having a mental map (Cummins et al., 2013, 4).

It is also worth mentioning that, in her discussion of approaching epistemology from the point of view of the value of understanding, Linda Zagzebski (2009) lends some support to assumptions (C) and (D) (and seems to accept assumptions (A) and (B)). She suggests that approaching epistemology from the perspective of understanding forces us to acknowledge that knowing does not always entail believing and that the object of knowledge is not always a proposition. She writes:

Knowledge might involve mental representations, but rather than to know exclusively through objects with the structure of sentences, one could know through many other kinds of structures, including maps, graphs, diagrams, and models. Some forms of understanding might not even involve representations. What happens when we understand a work of art or music, the psychological structure of a character in a novel, or a theory in physics? Do we have a kind of knowledge? If so, would it be accurate to say that what we know is reducible to a list of propositions? I find that dubious, and I suspect that contemporary epistemology has suffered by ignoring the value of understanding. I also suspect that understanding is connected with nonpropositional knowledge, which, as I mentioned earlier, is usually left aside in contemporary treatments in knowledge (Zagzebski, 2009, 7).

While I am sympathetic to Zagzebski's suggestion that understanding is connected with propositional knowledge, this lies beyond the scope of my present concern. The point, however, is that there is precedent in both epistemology and philosophy of mind for taking seriously the thesis of representational pluralism, as well as its psychological and epistemological variants. Here, my aim is to show that taking these theses seriously renders S&W's view that know-how consists in propositional knowledge dubious. To show that this account is dubious, I now turn to argue that satisfying condition (b) requires non-propositional knowledge.

2.3.2 THE CASE AGAINST STANLEY AND WILLIAMSON

In order to see why satisfying condition (b) requires non-propositional knowledge, we need to determine what work is done by practical modes of presentation in S&W's account. As mentioned above, S&W claim that thinking of a proposition under a practical mode of presentation entails having certain dispositions. Since they hold that knowing how requires thinking of a proposition under a practical mode of presentation, and since thinking of a proposition under such a mode of presentation requires having certain dispositions, knowing how, on their view entails having certain dispositions. In other words, having certain dispositions is necessary for knowing how.

At first pass, this seems problematic for S&W's view, insofar as their view is an intellectualist position. After all, a standard *anti*-intellectualist account of know-how holds that knowing how consists in having certain dispositions or abilities. However, a response is available for S&W. Although their view entails that having certain dispositions is *necessary* for knowing-how, it does not entail that these dispositions are

constitutive of knowing-how. Know-how is constituted by propositional knowledge, specifically, propositional knowledge under a practical mode of presentation. It's a just a feature of the way things work that dispositions always come along with know-how.

Nevertheless, the introduction of dispositions is problematic for S&W. On their view, practical modes of presentation are invoked to explain the connection between know-how and dispositions. They believe that invoking dispositions in this way does not require positing non-propositional knowledge. But presumably, these dispositions are the ones that enable performance. In the case of many activities, such as riding a bicycle, it is highly implausible that propositional knowledge accounts for dispositions that enable performance. More plausibly, the exploitation of representations formed on the basis of sensory motor data – practice, in short – accounts for these dispositions. At the very least riding a bicycle requires a motor program that is integrated with perceptual inputs. Following assumptions (B) and (C), this sort of information cannot be represented in a linguistic format.

If this is right, then in order to have dispositions that enable performance, one must practice the activity in question. The content that one acquires through practice is plausibly diverse in format, but it is highly implausible that all of the content is of a propositional variety. It is, however, plausible that the acquisition of this content enables one to entertain a proposition under a practical mode of presentation.

For S&W, propositional knowledge under a practical mode of presentation is necessary and sufficient for knowing how. Entertaining propositions under practical modes of presentation entails having certain dispositions, presumably dispositions that enable performance. But while entertaining propositions under practical modes of

presentation *entails* having these dispositions, it is implausible that this *explains* these dispositions. Rather possessing the content that one acquires through practice entails having the relevant dispositions and enables one to entertain the relevant proposition under a practical mode of presentation. In other words, entertaining propositions under practical modes of presentation entails having certain dispositions because acquiring the content that one acquires through practice entails having certain dispositions and entertaining propositions under practical mode of presentation.

Above, I suggested that, although having certain dispositions is necessary for know-how on S&W's view, this might not be problematic for their position because they can claim that despite dispositions being necessary for know-how, they are not constitutive of know-how. But now it appears that in order to have the relevant dispositions, one must possess the sort of content that one acquires through practice, content that will typically be, at least in part, non-propositional. While having this content entails having certain dispositions, it also may entail entertaining the relevant proposition under a practical mode of presentation. But now it appears that, while entertaining a proposition under a practical mode of presentation is necessary for knowing how, it is not constitutive of knowing how. Rather, the content that one acquires through practice, along with certain propositional knowledge, is constitutive of know-how. If this is correct, then while propositional knowledge is necessary for know-how, it is not sufficient, contrary to the view of S&W.

2.4 BENGSON AND MOFFETT ON KNOW-HOW

According to Bengson and Moffett (hereafter, B&M):

S knows how to X if and only if

(c) S stands in a non-propositional knowledge of relation¹⁷ to a non-propositional item, namely, a way of X-ing, w , and

(d) S has a grasp of a complete and correct conception of w .

Notably, B&M's view amounts to a "non-propositional intellectualism," as captured by condition (c). For our purposes, (c) can be understood as requiring that, in order to know how to X, one must have familiarity or acquaintance with a way of X-ing, and this familiarity or acquaintance is to be understood as a non-propositional knowledge relation.

Although B&M hold that propositional knowledge is not sufficient for know-how, condition (d) entails that such knowledge is necessary. In other words, requiring that one has a complete and correct conception of a way of X-ing in order to know how to X entails requiring that one have certain propositional knowledge in order to know how to X. While it is possible to have a non-propositional view of conceptions, such a view is not held by B&M. Their motivation for holding that (d) is a necessary condition for know-how stems from an observation that one can have knowledge of a way of X-ing without knowing *that* the way in question is a way to X. This is because, while they hold that having knowledge of a way of X-ing is non-propositional, it is in part grounded in propositional attitudes.

B&M discuss several ways in which one can fail to satisfy (d). First, one can simply lack a conception of w . As they note, one way to escape avalanches is by making swimming motions. A competent swimmer who has never heard of or encountered avalanches may have knowledge of this way of escaping avalanches and may also have

¹⁷ B&M refer to this as an *objectual knowledge* relation

the relevant ability. But since she has no conception of avalanches, she does not know how to escape them. In other words, she lacks a conception of the way of escaping avalanches, even though she has knowledge of this way.

The second way in which one can fail to satisfy (d) is by having an *incorrect* conception of *w*. Such a failure is illustrated by the following example (Bengson and Moffett 2012, 171):

Salchow. Irina, who is a novice figure skater, decides to try a complex jump called the salchow. When one performs a salchow, one takes off from the *back inside* edge of one skate and lands on the *back outside* edge of the opposite skate after one or more rotations in the air. Irina, however, is seriously mistaken about how to perform a salchow. She believes incorrectly that the way to perform a salchow is to take off from the *front outside* edge of one skate, jump in the air, spin, and land on the *front inside* edge of the other skate. However, Irina has a severe neurological abnormality that makes her act in ways that differ dramatically from how she actually thinks she is acting. So despite the fact that she is seriously mistaken about how to perform a salchow, whenever she actually attempts to do a salchow (in accordance with her misconceptions), the abnormality causes Irina to unknowingly perform the correct sequence of moves, and so she ends up successfully performing a salchow. Although what she is doing and what she thinks she is doing come apart, she fails to notice the mismatch.

Clearly Irina has the ability to do a salchow and the way in which she performs the jump is indeed a way for her to do so. However, according to B&M's view, she does not know how to do the salchow because she has an incorrect conception of how salchows are executed.

The third way in which one can fail to satisfy (d) is to have an *incomplete* conception of *w*. This occurs in cases where one has the ability to carry out a project, such as building a deck¹⁸, but lacks all of the information that is necessary for carrying out that project. Such a person has, for instance, to look up instructions in order to bring

¹⁸ B&M use the example of building a kytoon – a lighter than air kite.

the project to fruition. At the time of such a person's decision to look up instructions, B&M hold that the individual does not know how to carry out the project because he or she has only an incomplete conception of the way of doing so.

Finally, one may fail to satisfy (d) due to conceptual confusion. Here, B&M ask us to imagine that Irina corrects her conception of a way of doing a salchow by memorizing her coach's instructions. Her conception is now correct because she correctly believes that the way to do a salchow is to take off from the back inside edge of one skate and land on the back outside edge of the other after one or more rotations in the air. However, Irina suffers, like Burge's (1979) arthritis patient, conceptual confusion. Specifically Irina takes her back outside edge to be her front inside edge and her back inside edge to be her front outside edge. While Irina's conception of how to do a salchow is now otherwise correct and complete, she still fails to satisfy (d) because she lacks a sufficient mastery of certain concepts involved in this conception.

In regards to these examples, B&M write that, "The problem in each case ultimately can be traced to a problem in certain of one's propositional attitudes or to the absence thereof," (Bengson and Moffett 2012, 188). Although B&M discuss the problem in terms of "propositional attitudes," it is reasonable to infer that the requisite propositional attitudes are instances of propositional knowledge. For instance, in discussing the salchow case, they write, of Irina, that, "She is *mistaken* about the way to do a salchow (she conceives of a certain sequence of movements as constituting a way of doing a salchow when they do not) and hence does not know how to do one," (Bengson and Moffett 2012, 186, emphasis added). Irina clearly has a propositional attitude about how to do a salchow. But the problem is that this attitude amounts to a false belief about

how salchows are performed. In other words, she does not *know that* the way to do a salchow is to take off from the *back inside* edge of one skate and land on the *back outside* edge of the opposite skate after one or more rotations in the air.

2.5 AGAINST BENGSON AND MOFFETT

My case against B&M consists in demonstrating that there are real life cases that are similar to Irina's situation in all the relevant respects that seem to be clear cases of know-how. Since B&M's account entails that Irina does not know how to do a salchow, they are committed to denying that these real world instances of know-how are in fact such instances.

B&M's reason for denying that Irina knows how to do the salchow is that she has false beliefs about what she is doing, and thereby fails to satisfy (d). While the *Salchow* case may seem far-fetched due to the odd nature of Irina's disorder, the scenario illustrates an example of a phenomena which is in fact commonplace, that is, a case in which an agent believes herself to be doing one thing while in fact doing something else. Let's turn to three real life examples.

First, baseball batters are advised to "keep your eye on the ball." This suggests that a way to hit a baseball is to track the baseball's trajectory from the pitcher's release point until it comes into contact with the bat. But in fact, batters *cannot* "keep their eye on the ball" due to the high velocities of pitches and the limitations of the human eye's ability to track high speed movements (Hubbard and Seng 1954; Bahill and LaRitz 1984). If some successful hitters *believe* they hit by way of keeping their eyes on the ball, we have what is, in all the relevant respects, a *Salchow*-style case.

The second case comes from Dreyfus (2005, 63, footnote 32) who writes:

When Air Force instructor pilots teach beginning pilots how to scan their instruments, they teach the rule that they themselves were taught, and, as far as they know, still use. At one point, however, Air Force psychologists studied the eye movements of instructors during simulated flights and found, to everyone's surprise, that the instructor pilots were not following the rule they were teaching. In fact, as far as the psychologists could determine, they weren't following any rule at all (DeMaio et al. 1976).

Dreyfus's example provides another real life *Salchow*-style case, that is, a case in which individuals successfully X but have false beliefs about how they go about X-ing.

These two examples appear to constitute instances of know-how. Baseball hitters seem to know how to hit baseballs and Air Force instructor pilots seem to know how to scan their instruments. If B&M are committed to denying that Irina knows how to do the salchow, then they are also committed to denying that Air Force instructor pilots know how to scan their instruments, and that baseball players know how to hit baseballs. While making such denials is not incoherent, the existence of these cases gives us reason to doubt the necessity of complete and correct conceptions, that is, propositional knowledge, for know-how.¹⁹

The role of complete and correct conceptions in B&M's position raises a subtle ambiguity. If we consider, for example, Dreyfus's instructor pilot case, it seems that while the instructor pilots *know how to scan instruments* (but do not know how instruments are scanned), the Air Force psychologists, by way of studying the pilots, come to *know how instruments are scanned* (but do not know how to scan instruments). Similar considerations arise in the baseball example. Hitters know how to hit baseballs,

¹⁹ For a similar line of objection to intellectualism, see (Wallis 2008).

but not how baseballs are hit, while some psychologists know how baseballs are hit, but do not know how to hit baseballs.

In these cases where agents successfully X, but have false beliefs about how X-ing is done, B&M are committed to denying that the agents have know-how because they fail to meet the complete and correct conceptions requirement. Due to this denial, it would seem that B&M, and perhaps intellectualists in general, require that knowing how to X requires knowing how X-ing is done. However, the examples just discussed provide strong reason for denying that this is the case. In other words, the cases suggest that one can know how to X, without knowing how X-ing is done, just as one can know how X-ing is done without knowing how to X.²⁰

Perhaps more problematically, a final example suggests that there is an ambiguity in B&M's very notion of complete and correct conceptions. NASA computes escape velocity using Newtonian mechanics. So it follows that using Newtonian mechanics is a way for NASA to compute escape velocity. But According to B&M, for NASA to know-how to compute escape velocity, it must have a complete and correct conception of a way of doing these computations. In this case, it is not clear what having a complete and correct conception requires. If it requires having a complete and correct conception of the relevant physics, then this would entail that, according to B&M, NASA does not know how to compute escape velocity since Newtonian mechanics is an incorrect account of physics. On the other hand, if having a complete and correct conception of a way of computing escape velocities requires having a complete and correct conception of Newtonian mechanics, that is, a way of doing the computation that is effective (and

²⁰ See Hetherington (2008) for discussion of this distinction.

presumably a way that NASA knows to be effective), then NASA knows how to compute escape velocities in virtue of applying a false theory that they know to be false. In other words, NASA knows that Newtonian mechanics will work for the task at hand even though it involves entertaining some false assumptions. If NASA has a *complete* conception of Newtonian mechanics, there is a clear sense in which this conception is not *correct*. If what is required is that NASA has a correct conception of a way to compute escape velocities, and the way of doing this is to use Newtonian mechanics, then they do have a correct conception of the way.

Now suppose that Irina learns that, due to her condition, the “correct” way to do a salchow is not a way *for her* to do the jump. However, she could come to know that by entertaining a false description of how to do a salchow, she can get the job done. Under these conditions, Irina’s situation becomes just like the NASA example. She knows a way that is a way *for her* to do the salchow, and she has a correct conception of what she needs to do in order to execute the move. She may or may not know how the salchow is done (i.e. she may or may not be able to give the correct description of the maneuver), but she knows how to do it.

Of course, one might worry that if Irina comes to realize that the way she believes the jump is performed is incorrect, then this will undercut her ability. If we assume that she must believe the false description of how the jump is performed is correct, then the case is different from the NASA example (since NASA, of course, knows that Newtonian mechanics is not the correct account of physics), but is similar in all the relevant respects to the baseball case.

My discussion of B&M demonstrates that if propositional knowledge is necessary for know-how, then on their account, we will be forced to deny that many, seemingly clear cases of know-how are in fact such cases. Moreover, the notion of complete and correct conceptions is ambiguous, as illustrated by the *Salchow* and NASA examples. B&M's position, in particular the complete and correct conceptions requirement, rests on our having certain semantic intuitions in response to thought experiments, such as the *Salchow* example. But there is no reason to think that ordinary language is designed to be as precise as B&M's account requires; it did not evolve to accommodate cases like *Salchow*, or even the baseball example. To attempt to motivate B&M's position by appeal to semantic intuitions requires a revisionary account of how language works. That is, it requires revising the workings of language such that language becomes precise enough to accommodate the sorts of examples on which B&M rest their case. But, whenever we are talking about psychological terms, such as know-how, revision ought to be motivated by science, not intuitions of the sort required by B&M. There is no shortage of precedent for scientifically motivated revisions (consider 'motion,' 'force,' 'gene,' 'atom,' and so on). Why should we think 'know-how' is different? The *Salchow* example exploits a possibility that has been revealed by neuroscience, a possibility that would have been incomprehensible not long ago. While B&M are free to push for revision, such revision must be motivated scientifically, not by semantic intuitions.

In any case, the examples I have discussed appear to be non-controversial examples of knowing-how. According to B&M's position, these are not cases of knowing-how. It is, of course, open to B&M to maintain their position. However, the fact that these examples appear to be non-controversial as examples of knowledge-how

provides strong reason for denying that propositional knowledge is necessary for know-how.

2.6 IMPLICATIONS AND UPSHOT

Thus far in this chapter, I have offered reasons for rejecting two prominent intellectualist accounts of know-how. First, I have argued that for many activities, knowing how requires having non-propositional knowledge of a way to do the activity in question. This undercuts intellectualist views, such as S&W's, that hold that propositional knowledge is sufficient for knowing how. Second, I have argued that if propositional knowledge is necessary for know-how, as B&M and S&W both maintain, then we have to deny that many intuitively clear cases of knowing how are in fact such cases. Taken together, it appears that propositional knowledge is neither sufficient nor necessary for know-how.

Moreover, in making my case against S&W, I suggest that the content that one acquires through practice is quite plausibly constitutive of know-how. For many skills or activities, this content will be non-propositional. The plausibility of this claim stems from representational pluralism, and its psychological and epistemological variants. These theses, along with the representational theory of content, open space for a new account of know-how that is neither intellectualist nor anti-intellectualist. On such a view, propositional knowledge is, contra intellectualism, not always necessary or sufficient for know-how. However, know-how is not, contra anti-intellectualism, simply having an ability or disposition. Rather, knowing-how consists in possessing the content that that enables one to execute a task. In some cases, such as doing mathematics, this content may

be propositional. But in others, such as figure skating or skiing, this content is likely non-propositional. Here I do not have the space to give a full account of such a view.

However, I believe that understanding the nature of knowing-how requires moving beyond the intellectualist-anti-intellectualist dichotomy.

2.7 RYLE AND THE ORIGINS OF THE KNOW-HOW DEBATE

Generally, current philosophical discussion of know-how traces back to chapter two of Gilbert Ryle's, *The Concept of Mind*, in which Ryle conducts an examination of concepts of mental-conduct, "which belong to that family of concepts ordinarily surnamed 'intelligence'" (Ryle 1949, 25). The members of this family include the concepts we indicate with words such as 'clever,' 'sensible,' 'prudent,' 'logical,' and so on. Someone deficient in intelligence is described as 'stupid' (Ryle 1949, 25). However, Ryle claims that there is a distinction between being stupid and being ignorant.

Ryle takes this distinction to amount to one between intelligence and "possessing knowledge" (Ryle 1949, 26). One can fail to be intelligent despite possessing lots of knowledge. One can also exhibit intelligence, despite lacking lots of knowledge. However, Ryle took this distinction to be overlooked due to the influence of the intellectualist conception of mind. For intellectualists all mental conduct is defined in terms of cognition, and the primary exercise of the mind is to theorize, that is, find answers to questions. For intellectualists, other activities deemed intelligent are so deemed because they consist in the applications of these answers.

However, it is important to note that Ryle understands theorizing as an operation, that is, an ability that one has or something that one can know how to do. While finding

answers to questions, or coming to know true propositions is the goal of theoretical operations, theorizing is not the same thing as achieving this goal. Theorizing, is rather, a means to achieving the goal. Theorizing is a skill that is governed by standards or criteria that one can do more or less well.

Ryle's aim was to show, "that there are many activities which directly display qualities of mind, yet are neither themselves intellectual operations nor yet effects of intellectual operations"(1949, 26). Ryle does not deny that intelligence sometimes involves knowing true propositions. Rather, his point is that theorizing is one of many activities of the mind. Sometimes the mind engages in theorizing, and if it does a good job of doing so, the output will be propositional knowledge. But, contrary to intellectualism, there are many other mental operations that do not amount to theoretical operations, Theorizing is not, as intellectualists would have it, the primary exercise of the mind, but rather one of many things that we have the ability, or know how, to do. On Ryle's view, whether an ability involves propositional knowledge is orthogonal to whether it is an instance of know-how.

Ryle holds that when we describe someone as doing something intelligently, we ascribe to that person, not knowledge of truths, but the ability to do a certain sort of thing. While doing something well involves meeting standards or satisfying criteria, having the ability to do so does not merely consist in knowing these criteria. One must apply these criteria and regulate one's actions in accordance with them (Ryle 1949, 28).

Ryle notes that the above point is often expressed by saying that "an action exhibits intelligence if, and only if, the agent is thinking what he is doing while he is doing it"(Ryle 1949, 29). Intellectualists, he claimed, take this to mean that doing

something intelligent requires doing two things: to consider certain propositions, and to put these propositions into practice. “It is to do a bit of theory and then to do a bit of practice” (Ryle 1949, 29). But if theorizing is an ability, that is, something that one knows how to do, then there seem to be three elements behind intelligent performance. While the output of theorizing is a proposition, as mentioned above, theorizing does not just consist in knowing a proposition. Rather, theorizing is an activity that results in believing or knowing a proposition. Consider playing chess, in which the practice may be moving piece X to location Y on the board. In this case, we have the practice (moving the piece), propositional knowledge, and theorizing that leads to the propositional knowledge. Here, the relevant theorizing may resemble working through a practical syllogism that leads to the conclusion that one should move piece X to location Y.

Since intellectualists define intelligence in terms of apprehending truths they hold that what makes the difference between behaviors that do, and overtly indistinguishable behaviors that do not, display states of intelligence is that the former involve knowledge of certain propositions. In other words, they hold that:

- (1) Intelligence involves the operation of considering true propositions.
- (2) Practical activities described with intelligence epithets are properly so described because they are accompanied by internal acts of considering true propositions.

The first condition says that any operation that is, or is guided by, intelligence involves the agent having knowledge of true propositions. As described in (1), this propositional knowledge is a necessary, but not sufficient condition for intelligence.

The second thesis is a claim about why it is appropriate to describe intelligent behaviors as intelligent. The first thesis says that in order to count as intelligent, an action must involve propositional knowledge. The second says that in order to properly describe an action as intelligent, it must count as intelligent, meaning that the consideration of true propositions must be involved.

Ryle frames his position as the denial of intellectualism, *anti-intellectualism*, claiming that to do something intelligently is not to undergo a “double operation of considering and executing” (Ryle 1949, 30). Ryle argued that intellectualism leads to a fatal regress because theorizing is something that can be done more or less intelligently.

According to Ryle’s characterization of intellectualism, for an action to be intelligent, it must be guided by the grasp of true propositions. He argues that intellectualism leads to a vicious regress, because “The consideration of propositions is itself an operation the execution of which can be more or less intelligent, more or less stupid. But if, for any operation to be intelligently executed, a prior theoretical operation had first to be performed and performed intelligently, it would be a logical impossibility for anyone to ever break into the circle,” (Ryle 1949, 30).

In other words, for something to be done intelligently, it must be preceded and guided by theoretical activity, that is, the consideration of propositions. But since theorizing or considering propositions is something that can be done more or less intelligently, and something that one knows how to do, it too must be preceded by a prior act of intelligently considering propositions, and so on *ad infinitum*.

One concern with Ryle’s regress argument is that it fails to honor Fodor’s distinction between *mental competences* (i.e. various abilities such as playing chess or

speaking a language) and *mental traits* (e.g. intelligence or stupidity) (1968, 634–635).

Mental competences amount to abilities that we can carry out more or less well. Having a mental trait, on the other hand, such as intelligence does not require that one be good at some particular activity. Being able to exercise a mental competency is being able to do a certain thing (e.g. being able to play chess). Having a mental trait pertains to doing things in a certain way (e.g. being able to play chess intelligently).

On Fodor's account, "Traits give rise to adverbs, competences to verbs," (1968, 635). For instance, if we say that Jones plays chess intelligently, "playing chess" denotes a competence, whereas "intelligently" denotes a trait. For this reason, Ryle's terminology suggests that he is targeting an intellectualist account of traits, rather than an intellectualist account of competencies. Recall that, in offering his regress argument, he writes, "if, for any operation to be *intelligently* executed, a prior theoretical operation had first to be performed and performed *intelligently*, it would be a logical impossibility for anyone to ever break into the circle," (Ryle 1949, 30, emphasis added).

The problem for Ryle is that he seems to conflate mental competences and mental traits. According to Fodor, only mental competences play a role in generating behavior, and mental traits pertain to the manner in which the behavior is performed. Ryle appears to conflate the distinction by holding that for an action to be intelligent, it must be preceded by the consideration of propositions, and this considering of propositions must be done *intelligently*. Ryle holds that this considering of propositions must be intelligently executed in order to account for how an agent considers the propositions appropriate to her activity or problem at hand. In other words, discriminating between the propositions that are relevant, and those that are inappropriate requires intelligence.

Fodor argues that Ryle's regress argument only succeeds if it is targeted against an intellectualist account of mental traits, but that intellectualism should be understood as a theory about the role of mental processes in the generation of behavior, and having a trait is not a matter of producing behavior (1968, 636). Rather, having a trait amounts to being able to behave in a certain way, for instance, not just being to do something, but being able to do it well. Fodor denies that traits are involved in the production of behavior because if they were, then the instructions for engaging in an activity would be distinct from the instructions for doing that activity well. For instance, he writes, "if instructions for speaking Latin are distinct from instructions for speaking Latin well, then these latter must, in turn, be distinct from instructions for speaking ((Latin well) well) and so on *ad infinitum*," (Fodor 1968, 636).

Fodor's take appears to be that, for Ryle's argument to get off the ground, it must aim to show that intellectualist accounts of X-ing *intelligently*, for instance, lead to a vicious regress. But since 'X-ing intelligently' is not the name of an activity distinct from X-ing, intellectualists merely need to account for acts of X-ing, which allows them to avoid a vicious regress.

Whether or not Ryle was aware of Fodor's distinction between mental traits and mental competences, it is not clear that the regress argument has to make reference to mental traits. While Ryle uses mental adverbs, which refer to traits, in the course of offering his regress argument, these are not essential to the argument. Theorizing is an activity, and so it falls under Fodor's notion of a mental competence. On the assumption that theorizing, in virtue of being a competence, amounts to know-how, then intellectualism needs to offer an account of it. To do so, intellectualists must appeal to

prior acts of theorizing, and even prior acts of theorizing to explain these. Formulated in this manner, Ryle's regress argument can get off the ground without the use of mental adverbs.

While some might deny that theorizing amounts to know-how, such a denial would be unmotivated on Fodor's account. While he acknowledges that there is a distinction between what we know how to do, and what we know how to explain, he also acknowledges that the ability to offer explanations is a skill and something we know how to do (Fodor 1968, 633–634). Since Fodor is prepared to allow explaining to be treated as a case of know-how, it seems he must also treat theorizing in the same way.

Still, even if Ryle's regress can be formulated without the use of mental adverbs, it does not seem that it will show that Fodor's brand of intellectualism is subject to a vicious regress. Fodor could grant that in order to give an account of theorizing, understood as an instance of know-how, we will need to appeal to further acts of theorizing. However, we will not be forced to continue positing prior acts of theorizing *ad infinitum*. Rather, Fodor allows that psychological explanations can "bottom out" in elementary operations. He writes, "A completed psychological theory must provide systems of instructions to account for the forms of behavior available to an organism, and it must do so in a way that makes reference to no unanalyzed psychological processes," (Fodor 1968, 629). These unanalyzed psychological processes are to be understood as *elementary operations*. When we arrive at an elementary operation, we cannot ask for instructions for performing it by appealing to some further sequence of operations. These operations are not performed in some way or other; they are merely performed.

By appealing to elementary operations, Fodor appears to have a way to avoid the vicious regress to which Ryle took intellectualism to be committed. Nevertheless, there are other reasons for thinking this move may be problematic, which will be discussed below.

Paul Snowdon (2004) has raised several challenges to Ryle's account of intelligence and know-how. While Snowdon's challenges appear to result from a misunderstanding of Ryle's position, they are worth discussing in so far as they make the position in question clearer. According to Snowdon, Ryle is committed to the "Capacity Thesis" (hereafter CT), which is the claim that an ascription of knowledge how to X is equivalent to an ascription of the capacity to X. Snowdon argues that CT is false because having the capacity to X is not necessary for knowing how to X. He provides six examples of cases in which it intuitively seems that someone knows how to X without having the ability or capacity to do so.

However, Snowdon's examples all exploit an ambiguity in the use of "ability" or "capacity". Specifically, his examples exploit either a lack of what Noë (2005, 283) has called "enabling conditions" or the presence of what we might call "disabling conditions". An enabling condition may be understood as a condition that must be met in order for someone to be able to exercise some particular capacity. A disabling condition may be understood as a condition that, when met, prevents a subject from being able to exercise a capacity that she could exercise under normal circumstances. For instance, consider one of Snowdon's cases:

I know how to make Christmas pudding, and have done so frequently. Alas, a terrible explosion obliterates the world's supply of sugar, so that no one is able to make it. I still know how to but, like everyone else, cannot (Snowdon 2004, 8).

Ryle took “know-how”, understood as abilities and skills, to amount to “higher-grade” dispositions, “the exercises of which are indefinitely heterogeneous” (Ryle 1949, 44). Knowing how to make Christmas pudding, for Ryle, amounts to having dispositions to make Christmas pudding well or successfully in certain circumstances. But in order for one to exercise this dispositional ability, one needs the right ingredients. The sudden depletion of sugar in Snowdon’s examples does not suddenly strip people of their abilities, understood as heterogeneous dispositions, to make Christmas pudding anymore than being far away from a guitar strips a guitarist from his ability or dispositions to play the instrument skillfully.

Snowdon introduces other cases aiming to show that being able to X is not sufficient for knowing how to X, again exploiting the ambiguity of “ability”. There appear to be cases in which one has the ability or capacity to X without knowing how to do so. S&W offer the example of digesting food. “Hannah is able to digest food” does not seem to entail that “Hannah knows how to digest food.” Due to these sorts of cases, it might seem that for the claim that being able to X entails knowing how to X to have any plausibility, the values for X must be restricted so as to exclude things like digesting food. Perhaps the values for X should be restricted to intentional actions. S&W take it that Ryle has something like this in mind when he speaks of actions that are “intelligently executed” (Ryle 1949, 30). Whatever one thinks intelligence amounts to, digesting food does not seem to be something that one does with intelligence.

While restricting the range of actions that we know how to do to those that we do intentionally may seem appropriate in light of the food digesting example, this oversimplifies matters. It may be correct that digesting food is not something that *one*

does with intelligence, but this does not entail that it may not be done intelligently. It is just that digesting food is not something that *one* does, it is something that *one's digestive system* does. Moreover, if we restrict know-how to intentional actions, then this will entail that we do not know how to perform cognitive tasks that require unconscious processing, for instance, it will entail that we do not know how to visually estimate distance.²¹ This seems wrong. In order to account for the fact that we do seem to know how to do many such tasks, we can appeal to Dennett's distinction between personal and subpersonal levels of explanation (1986). In his discussion of the distinction, Dennett uses the example of pain. At the subpersonal level, explaining pain involves giving a physiological account in terms of operations of an organism's pain network. At the personal level, our concern is not with physiology, but rather with the "mental phenomenon" of pain. Giving a physiological account of pain at this level would be inappropriate.

While Dennett discusses pain to illustrate the distinction, depth perception serves as a better example for my present purposes. While people are able to visually estimate depth, generally they do not seem to know how to do so.²² Rather, visually estimating depth is something that people's brains do for them. In this sense, depth perception is on par with digestion, albeit more cognitive.

Ryle's was concerned with mental concepts that apply at the personal level. While Ryle equates knowing how with dispositional abilities, because he is operating at the

²¹ The question of whether people know how to visually estimate distance is somewhat ambiguous. In a case where we consciously visually estimate distance, the activity is distinct in the relevant sense from food digestion. But in cases where we do not consciously visually estimate distance, the activity appears to be on par with digestion. It may be more accurate in the former case, than in the latter, to speak of *people* knowing how to visually estimate distance.

²² With the possible exception of cases of conscious distance estimation.

personal level, he should not be read as being committed to anything like Snowdon's suggested CT, especially when the capacities under consideration operate at the subpersonal level. The CT conflates the personal and subpersonal levels by arguing that anti-intellectualism is false because we do not know how to do activities at the personal level that we, or more appropriately our subpersonal systems, have the capacity to do at the subpersonal level.

Now let's turn to one of Snowdon's cases in which there is a small and narrow opening in a rock. A person, S, is agile and skinny and could get through the rock. But S has no knowledge of the rock or task, and so does not know how to get through the rock. While S is clearly "able" to get through the rock in some sense, because he has no knowledge of the rock or the task, he has no dispositional-abilities regarding the task,²³ and so there is no reason to suppose that Ryle would take him to know how, nor be able in the required sense.

As noted in the previous section, contemporary intellectualists, characterized by S&W and B&M are concerned with the conditions under which propositions expressed by sentences of the form, "S knows how to X" are true. As Ryle characterizes intellectualism, the view holds that actions are intelligent, or exhibit knowledge, in so far as they consist in the application or utilization of knowledge, understood in terms of true propositions. Against this claim, Ryle held that knowing how does not require the possession or application of propositional knowledge.

²³ This will depend, in part, on how we fill in the details of the case. If S is trapped and her survival depends on getting through the rock, it is plausible that she will quickly develop the necessary dispositional-abilities, even if she does not have them initially. Upon developing these dispositions, it is more plausible to hold that she knows how to get through the rock.

Given that contemporary intellectualists generally take themselves to be responding to Ryle in some way, it is important to note that the position as characterized by Ryle appears at least slightly different than the position as characterized by S&W and B&M. Ryle explicitly identifies intellectualism as a position regarding the nature of the mind. S&W and B&M are concerned, at least in part, with the truth conditions of propositions that attribute know-how to agents. In the next section, I argue that these differences reflect the fact that, within the literature, there are two distinct debates taking place regarding the status of knowledge-how.

2.8 TWO DEBATES, FOUR POSITIONS

Generally, the know-how literature has focused on a debate between intellectualists, who equate knowing-how with propositional knowledge, and anti-intellectualists who hold that know-how is distinct from knowing-that. Generally, anti-intellectualists follow Ryle in equating know-how with certain abilities, skills, or dispositions. However, framed in this broad manner, the literature overlooks a distinction between two debates. Given the intellectualist/anti-intellectualist distinction, and the two debates, four general positions emerge.

A good deal of the know-how literature focuses on determining the proper semantics analysis of “know-how” ascriptions: What are the truth conditions for sentences like “Hannah knows how to ride a bicycle,”? But alternatively, the debate between intellectualists and anti-intellectualists can be understood as a debate about the correct psychological explanation for various skills or abilities, in particular whether they are to be explained in terms of the application of “theory” or stored propositional

knowledge, as (for example) in classical strong AI, or whether they are the results of non-propositional processing of information, as (for example) in connectionist accounts.

While parties to the latter debate typically refer to these abilities as “know-how,” they are not concerned with whether this usage matches up with ordinary language or semantic analysis. Their use of 'know-how' is designed to distinguish non-propositional processing from propositional processing. These are important explanatory issues surrounding mental competencies, whether or not we label them cases of “know-how.” Given these two debates, intellectualism and anti-intellectualism can be understood as theses regarding either. This gives us a total of four general positions, which I now turn to discuss.

Semantic intellectualism is the view that sentences of the form, “S knows how to X” ascribe propositional knowledge regarding X-ing to S and so knowing how reduces to knowing that. Negatively, semantic intellectualism holds that knowing how does not amount to certain abilities or dispositions. *Semantic anti-intellectualism* holds that sentences of the form, “S knows how to X” ascribe abilities or dispositions to X to S and denies that knowing how amounts to or reduces to propositional knowledge.

Setting aside semantics, others are concerned with the question of how we should explain mental competencies or intelligent action, a central question of cognitive science. Parties to this debate are concerned with what types of representations and processes that explain a system’s ability to exhibit intelligent behavior (see Fodor 1968). In light of Dennett’s distinction between personal and subpersonal levels of explanation, there is a not a clear divide between intellectualists and anti-intellectualists in the debate over psychological explanations.

Broadly speaking, we could define *psychological intellectualism* as the claim that an agent's ability to X is explained in terms of processing propositional or linguistic representations that answer the question, "How does one X"? This is illustrated in the Chomsky/Fodor account of language use and understanding. On this view there is a little linguist in our heads that possesses a theory of our language, and our linguistic know-how or competence consists in the application of this theory during linguistic exchanges. On the other hand, *psychological anti-intellectualism* can be understood as the claim that an agent's ability to X is not explained by appeal to processing propositional representations. Some hold that these abilities involve the processing of non-propositional representations (e.g. Churchland) while others hold that abilities are wholly non-representational (e.g. Dreyfus).

While Ryle, at times, discusses intellectualism and anti-intellectualism as positions regarding ordinary language, or the semantics of know-how attributions, his primary concern was with offering a psychological account of mental competencies. For this reason, one might take Fodor to illustrate the sort of intellectualism that Ryle had in mind. However, there are important differences between Fodor's intellectualism, and intellectualism as characterized by Ryle. On Ryle's view, intellectualism is committed to the claim that intelligent actions are characterized as involving explicit theorizing, and the application of truths arrived at through theoretical operations. This constitutes one version of psychological intellectualism. On this characterization, it seems that an intellectualist could not draw a distinction between knowing how to X, and knowing how to answer the question, "How does one X?"

Fodor's account, however, has the resources to honor this distinction. He writes, "the intellectualist account of X-ing says that, whenever you X, the little man in your head has access to and employs a manual on X-ing; and surely, whatever is his is yours" (1968, 636). While Fodor does not intend the little man and his manuals to be literal descriptions of the workings of the mind, the metaphor captures his commitment to the idea that agents employ rules in executing intelligent operations. Fodor holds that when an organism knows how to X, a true simulation of the organism's behavior will provide an answer to the question, "How does one X?" If we have a machine that optimally simulates an organism's behavior, a

"given behavior type will appear in the machine's repertoire if and only if the corresponding type of behavior appears in the repertoire of the organism; and second, for each type of behavior in the repertoire of the machine, there exists a sequence of sentences of English that the programming language of the machine maps onto the sequence of machine states which terminates in that behavior (Fodor 1968, 639)."

From this, Fodor concludes that such a sequence of English sentences amounts to a true description of the processes underlying the system's output. Fodor's intellectualist commitment is made salient in his claim that, "If D is a true description of the etiology of an event e, and if e' is an event numerically distinct from e but of the same kind as e, then it is reasonable to infer, *ceteris paribus*, that D is a true description of the etiology of e'," (1968, 639).

Fodor's idea is that we can understand how an organism engages in intelligent behavior by coming to know what processes underlie an optimal machine simulation of that organism's behavior. Such a simulation provides us with an account of how the organism engages in the behavior in question. We describe these machine's computations

in terms of rules, and instructions, that is, propositionally. Since we can infer like causes from like effects, we can infer that machine programs that simulate the organism's behavior represent the organism's tacit knowledge. In other words, we can infer that the organism's tacit knowledge is propositional.

Fodor's intellectualism is anti-Rylean because we inherit the knowledge possessed by our subpersonal agents ("surely, whatever is his is yours"). However, this view is distinct from Ryle's characterization of intellectualism because Fodor allows that the propositional knowledge implicated in behavior is tacit knowledge. If an agent employs rules or regulative propositions in her behavior, and she is unable to articulate these rules, then she has tacit knowledge of them.

However, according to Dennett's distinction between the personal and subpersonal levels, we should deny that organisms inherit the knowledge possessed by subpersonal agents. On such a denial, Fodor's view does not qualify as the sort of intellectualism described by Ryle because it is not intellectualist at the personal level, which is the level of Ryle's concern. However, this does not make Fodor a Rylean. If Ryle was unfriendly to intentional explanations at the sub-personal level, and if accepting such explanations makes one anti-Rylean, then both Fodor and Dennett come out as opposed to Ryle's account of the mind. Of course, being opposed to Ryle does not make Dennett and Fodor allies. On Dennett's view, we should not model subpersonal processes on personal level processes, which is just what Fodor does.

One could of course make an appeal to tacit knowledge that is quite different from Fodor's. For instance, instead of positing a little man in the head who consults manuals to engage in intelligent behavior, one could posit a trained neural network. If we follow

Fodor in holding that the knowledge possessed at the subpersonal level can be inherited at the personal level, then no propositional knowledge will enter the picture at either level.

2.9 PROBLEMS WITH OVERLOOKING THESE DISTINCTIONS

Given that the two debates have become entangled in the know-how literature, it is natural to wonder to what extent, if at all, they are interrelated. One might think, for instance, that engaging in linguistic analysis of sentences of the form, “S knows how to X,” tells us something about the nature of the mind because semantics provides us with the truth conditions of these statements. For instance, an intellectualist might argue that because semantics tells us that the truth conditions for know-how attributions are propositional, S’s knowing how to X consists in S’s knowing that p, where p constitutes the truth condition for the proposition, “S knows how to X.” Since S knows that p, and p is the truth-maker for S’s knowing how to X, then S’s X-ing competency should be explained in terms of her knowledge that p.

While arguments of this sort are not uncommon in philosophy of mind, they constitute an instance of what Roth and Cummins (2011) call *epistemological poaching*. One engages in poaching by arguing from premises about the semantic analysis of sentences that use “mental” terminology to a conclusion about the structure of the mind. As Roth and Cummins put it:

One starts, for example, with a truth-conditional analysis of belief sentences, and argues, let’s say, that ‘believes’ is a three place relation between a believer, a proposition and a sentence in the language of thought (LOT) that expresses it (e.g., Fodor 1981). One then notes that some belief attributions are true. Since the truth condition for belief attributions requires a belief relation between a believer, a proposition and

an expression in LOT, it seems that anything to which one can truly attribute beliefs must harbor psychological states with precisely that structure. And, on the assumption that the brain realizes psychological states, we get a conclusion about the structure of the brain *without having to do a single experiment*.²⁴

Roth and Cummins provide strong reasons for rejecting the view that the structure of the mind can be understood through semantic analysis. The claim is not that know-how ascriptions lack truth conditions. But we must be careful to distinguish the question of the truth conditions for ordinary attributions of know-how from the question of whether these truth conditions are satisfied. This distinction may be overlooked if one assumes a direct reference theory according to which “knows-how” refers to whatever mental states account for our ability to act intelligently, that is, the mental states that are constitutive of practical knowledge. Such an assumption is applicable only if there is a list of mental properties or states that are non-coincidentally correlated, properties for natural kinds. I have no stance on the question of whether know-how is a natural kind, though I suspect that it is not. If this is correct, then we have no reason for thinking that the semantically correct truth conditions for know-how attributions are satisfied. If, on the other hand, know-how is a natural kind, we have little reason for thinking that armchair reflection will reveal what the truth conditions of know-how attributions are.

For instance, it could turn out that C is the semantically correct truth condition for ordinary know-how attributions, but that, ordinary attributions of know-how are false thus construed. If C is the semantically correct truth condition for ordinary attributions of know-how, this brings out an assumption about the structure of the mind that is built into

²⁴ One might object that this is uncharitable to Fodor. Perhaps Fodor is offering an inference to the best mechanical explanation systematicity, logical coherence, reasoning, and productivity. The problem is such an inference to the best explanation rests on a bad assumption, namely, that cognition is structured in accordance with a language, namely, a LOT.

language. However, there is no reason to assume that the assumptions about the mind that are built into language are correct. This is why epistemological poaching is not an appropriate methodology for answering empirical questions about the structure of the mind.²⁵

To engage in poaching is to assume that semantics gives us the correct truth conditions for sentences that use mental terminology, and that scientific accounts of the mind are beholden to semantic analysis. But if this assumption were correct, then this would mean that the mind is structured such that the language of thought (LOT) hypothesis and the classical program provide the correct account of mental structure. However, parties to the debate over LOT and the classical program take this to be an empirically grounded debate that is orthogonal to issues surrounding the correct semantic analysis of know-how attributions. If semantics and science disagree then this tells us that the truth conditions of ordinary know-how attributions are not satisfied, not that science has gotten things wrong.

Of course one could hold an intellectualist or anti-intellectualist view about the semantics of know-how ascriptions while remaining neutral on empirical questions regarding the structure of the mind and thereby avoid the unwarranted move from semantics to psychology. However, many participants in the know-how literature have crossed the lines between these two debates. This may be most obvious in S&W who motivate their account by explicitly appealing to Karttunen's account of the semantics of embedded questions, which leads them to the view that knowing-how to X requires knowing *that* some way is a way for one to X. If S&W were solely concerned with

²⁵ This does not rule out a role for semantics altogether. Semantics may be useful for determining what our everyday conceptions of various concepts are. When the concepts of interest are scientific, we should defer to science to see if these conceptions are satisfied.

semantic analysis, we should expect their account to stop here. Semantics tells us that sentences of the form, “S knows how to X,” ascribe to S the answer to the embedded question, “How does one X?” This answer consists in knowing a proposition, namely, that *w* is a way for S to X. However, as discussed above, on S&W’s view, while this propositional knowledge is a necessary for knowing how, it is not sufficient. The discussion of the bicycle riding example makes it clear that they think appealing only to this sort of propositional knowledge falls short of explaining know-how, hence the requirement that the relevant piece of propositional knowledge be entertained under a PMP. PMPs allow S&W to explain the connection between know-how and dispositional states, which in turn explains an intuitive connection between know-how and action. While S&W do not think positing PMPs violates the intellectualist commitment to know-how being purely propositional, I have argued above that this is not a tenable position.

While B&M do not explicitly appeal to semantic analysis to establish their position, as mentioned above, their position is motivated by eliciting semantic intuitions in response to thought experiments. This move constitutes an instance of poaching. B&M must assume that the intuitions that are generated by *Salchow* are indicative of the truth conditions of know-how ascriptions. If these intuitions result in the judgment that Irina does not know how to do the salchow, then the idea is that this demonstrates that she fails to satisfy the truth conditions for know-how attributions, from which they conclude that she fails to know how. But, as discussed above, we have no reason to think that ordinary language is designed to handle cases like *Salchow*.

It is not just intellectualists who cross the lines between the debates over semantics and explanatory issues of psychology. Ryle, in many places, takes an ordinary

language approach in motivating anti-intellectualism. For instance, he writes, “When a person is described by one or other of the intelligence-epithets...this description imputes to him not the knowledge, or ignorance, of this or that truth, but the ability, or inability, to do certain sorts of things,” (Ryle 1949, 27). At the same time, Ryle is clearly not just concerned with semantics or ordinary language use. His stated primary aim in the second chapter of *Concept of Mind* “is to show that there are many activities that display qualities of mind, yet are neither themselves intellectual operations nor yet effects of intellectual operations,” (Ryle 1949, 26). This makes it clear that his interest indeed lies with the structure of the mind, though he may well have thought that ordinary language serves as a window through which we can come to know how things are.

While understanding how ordinary speakers use sentences of the form, “S knows how to X” may be a worthwhile project in its own right, its scope should be understood as pertaining to how people use language. While this is an empirical question, it is distinct from empirical questions regarding the structure of the mind and the role that cognition plays in the generation of intelligent behavior. These are questions properly addressed by cognitive science, not linguistics or ordinary language philosophy. While people may use mental terminology in a way that presupposes a particular account of the mental, this language use does not constitute evidence for claims about how the mind is structured.

History is replete with cases in which ordinary usage of terms fell into conflict with scientific approaches. For instance, compare how ordinary language treated ‘fish,’ ‘motion,’ or ‘life’ 200 years ago. Language is about the world, and how we use language and the concepts that underlie our usage is influenced by our beliefs about the world.

Linguistics analysis is an appropriate method for determining how ordinary language works, and ordinary use of ‘know how’ is no exception. Studying ordinary language in this way will bring out various assumptions, both tacit and explicit, regarding the structure of the mind in the case of mental terms such as ‘belief’ and ‘know how.’

Semanticists are certainly entitled to tell us how language works, but they are not entitled, on the same grounds, that assumptions built into language are correct.

2.10 ALTERNATIVE TO CROSSING BOUNDARIES

Attempting to use semantic analysis of knowledge locutions in order to understand the structure of the mind results, in part, at least, from a failure to take seriously the thesis of representational pluralism.²⁶ The use of linguistic analysis to answer questions about the mind and cognition assumes, at least tacitly, that representational pluralism is false, and that cognition is structured so as to be apt for semantic analysis, that is, structured around a language of thought that has the same kind of structure as natural language.

B&M seem to allow for some degree of pluralism, in holding that know-how requires standing in a non-propositional knowledge-of relation to a way of acting, where ways are understood as being non-propositional. However, they take it that these knowledge-of relations are grounded in certain propositional attitudes, so that ultimately knowledge-how has a crucial propositional component. S&W come closer to explicitly denying pluralism. While they do acknowledge a connection between know-how, action,

²⁶ Again, this is not to say that there is no use for semantics altogether. Semantics may provide a guide for determining what our pre-theoretic understanding of scientific concepts amounts to. But using semantics to engage in epistemological poaching assumes that the mind is structured in a way that semantic analysis can analyze, that is, like natural language.

and having certain dispositions, they take pains to explain this in terms of propositional attitudes by appeal to PMPs.

The most important difference between the intellectualist positions offered by S&W and B&M are that while the former take propositional knowledge of a certain sort to be both necessary and sufficient for know-how, the latter take it to be only necessary, acknowledging that a non-propositional knowledge-of relation is also required. But despite the requirement of propositional knowledge on both accounts, both S&W and B&M make efforts to show that their views have implications for how we should think about mental processes. Abandoning their propositional commitments, and acknowledging representational pluralism allows them to achieve this end. For S&W, as I have discussed, an acknowledgment of pluralism allows them to accomplish what they seek to achieve through appeal to PMPs. For B&M, pluralism makes sense of the non-propositional, knowledge-of relation that they argue is required for know-how.

2.11 WHY ALL THE SEMANTICS?

Knowledge and intelligence are cognitive states or activities. Since epistemology is, or encompasses, the theory of knowledge, the field should take seriously psychological accounts of how the mind represents and processes information. However, most of the field approaches the study of knowledge using linguistic analysis. This occurs in both mainstream epistemology, which focuses almost exclusively on propositional knowledge, and in the know-how literature.

The methods by which most epistemologists operate presuppose that something like folk psychology captures the structure of the mind, where folk psychology is

understood as the view that the mind represents information in a linguistic or propositional format. If one endorses or operates under this presupposition, then it is natural to think that engaging in poaching is an appropriate method for coming to understand the mind's structure and processes. That is, if one thinks that the mind represents and operates on propositional attitudes, then linguistic analysis seems like an appropriate method for understanding the mind's contents.

In chapter 1, I argued that the focus on propositional knowledge in mainstream epistemology is not the result of our coming to have a better understanding of the structure of knowledge, but rather an artifact of the field's concern with skeptical regress arguments and offering analyses of propositional knowledge. In other words, while most epistemology operates as though all knowledge is propositional, we lack strong reasons for thinking this is actually the case. In this chapter I have shown that operating under this propositional knowledge framework presents difficulties for explaining actions and behaviors that appear to exhibit knowledge or intelligence, that is, actions and behaviors that we know-*how* to do.

Focusing primarily on S&W and B&M, I have argued that allowing for representational pluralism enables us to explain many exhibitions of intelligence that cannot be explained under the presupposition that all knowledge is propositional, or even under a weaker presumption that all knowledge has at least a propositional component. Moreover, as discussed in chapter 1, moving beyond a purely propositional framework allows us to develop norms of rationality that are applicable to the circumstances in which we typically find ourselves, that is norms of *practical* rather than *truth-directed* rationality.

In the next chapter, I offer a new framework for epistemology that bridges the gap that has long stood between philosophical and empirical approaches to understanding knowledge.

CHAPTER 3

A FRAMEWORK FOR A PLURALISTIC EPISTEMOLOGY

3.1 INTRODUCTION

Cummins et al (2004) suggest that philosophy operates under a tradition that distinguishes epistemology from a broader study of rationality. While mainstream epistemology focuses on propositional knowledge, and evidence-based justification of belief, a broader study of rationality examines not only the norms of rational belief formation, but also practical reason, which encompasses rational action.

In chapter 1, I argued that mainstream epistemology's focus on propositional knowledge is primarily due to the focus on the analysis problem, which emerged out of a concern with skeptical regress of reasons arguments which go back to the ancient skeptics and more recently with the Gettier problem (Gettier 1963). While concern with the analysis problem may explain why the epistemology literature has had the focus it has had over the last several decades, there are also assumptions about the nature of cognition, rationality, and intelligence that underlie the focus on propositional knowledge and truth-directed norms of rationality.

Generally, rationality is understood as epistemic constraint satisfaction. Epistemic constraints provide norms by which we can evaluate epistemic systems for good or correct performance.²⁷ Good or correct performance must, of course, be understood relative to a particular goal or set of goals. In epistemology, it is generally taken for granted that the goal of an epistemic agent qua epistemic agent is to form beliefs that are

²⁷ This is not to say that there was no rationality before we began to articulate epistemic constraints. Rather, studying behavior in order to determine what constitutes good or correct performance allows us to articulate these constraints.

true, and avoid forming beliefs that are false. Good or correct performance, then, is understood in epistemology as performance that leads to believing true propositions, so insofar as epistemology is concerned with normative standards of rationality, it is concerned with normative standards of belief formation, and takes reasoning to consist in making inferences among propositions.

The activity of distinguishing true propositions from false ones by way of considering evidence is generally discussed in terms of justification. Given one's evidence, what is one *justified* in believing? Justification is taken to be a central epistemic constraint that must be met by epistemic agents in order for these agents to be rational. As discussed in chapter 1, the normative standards of rationality that emerge from the propositional framework in epistemology are properly understood as normative standards of truth-directed rationality, which amounts to a theory of justification. Given one's evidence, what is one justified in believing? Since the theory of knowledge is concerned, in part, with the normative standards of justified belief, and justification is understood as a truth-conducive property, it is unsurprising that the picture of normative rationality that emerges from the field is of the truth-directed variety.

It is not clear, nor obviously significant for present purposes, what came first in epistemology: the propositional framework, or the truth-directed take on normative standards of rationality. However, it is clear that these two perspectives go hand in hand. Normative standards of rationality are designed to govern or prescribe rational behavior relative to specific goals, and the achievement of specific goals requires specific resources and capacities. Epistemology assumes that the primary goal of an epistemic or

cognitive system is to arrive at true beliefs. This is precisely the sort of goal or activity that truth-directed standards or normative rationality are designed to evaluate.

Whatever the merits of the fit between epistemology's propositional framework and its standards of truth-directed rationality, work in cognitive science shows that epistemology's propositional take on cognition places limits on what the field's standards of rationality can evaluate. The development of connectionism, for instance, suggested that cognition may not require propositional attitudes. Churchland and Churchland (1999) argue that we should eliminate propositional attitudes altogether and suggest that we should instead understand intelligence and cognition in terms of neural processes, such as those modeled by connectionist networks. Haugeland (1991) and Cummins (1996) argue that non-linguistic representations (imagery, activation patterns, and so on) don't have propositional contents at all. Since these representations lack propositional contents, they cannot be assessed for truth. Rather these representations must be assessed for accuracy across various, sometimes competing, dimensions. The general lesson to be drawn from this work in cognitive science is that a good deal of cognition is not structured in accord with the sort of logical inferential relations among propositions that are the mainstay of traditional epistemology and truth-directed rationality.

Since epistemology's standards of truth-directed rationality are equipped only to evaluate cognitive system's whose goals are to believe true propositions, they cannot be used to evaluate any form of cognition that is not structured in accord with logical inferential relations among propositions. They cannot, for instance, evaluate the behavior

of connectionist networks²⁸, or a cognitive system that reasons by using imagery or scale models.²⁹

A brief caveat is in order here. There are cognitive systems that use imagery or models to realize truth-evaluable states. The problem is that truth-directed accounts of rationality assume that epistemic cognition is structured in accordance with logical inferences among propositions. Presumably, this sort of inference is possible in systems that use imagery or models to realize belief-like, truth-evaluable states. Truth-directed standards of rationality are equipped to evaluate a system's performance in making inferences among propositions. The problem, however, is that truth-directed rationality does not have the resources required to demonstrate sensitivity to the role that non-linguistic representations play in this reasoning. In these sorts of cases, it seems plausible that it is really the non-linguistic representations that are doing the epistemic heavy lifting. The belief-like states that these systems can realize are merely the output of this heavy lifting. If we don't have some means of evaluating the role of the non-linguistic representations, then we are overlooking a good deal of cognitive work that is epistemically significant.

In any case, since cognition is not limited to entities that operate exclusively in terms of propositional representations, we need rational and epistemic standards that are formulated to account for *cognitive diversity*. Cognitive diversity is the thesis that there is a good deal of diversity across cognitive systems and this diversity is realized in different ways. Different cognitive systems have different resources, architectures, limitations, practical constraints, and goals. In light of cognitive diversity, the study of rationality

²⁸ The exception, perhaps, being connectionist networks that implement classical architectures.

should adhere to *rational diversity*, or diversity in “rules of right reason,” (Cummins et al 2004).

Since epistemology operates under a perspective from which cognition consists in making inferences among propositions with the goal of arriving at true ones, it is not equipped to accommodate rational or cognitive diversity. In other words, there is a sort of mismatch between what cognitive science tells us that a normative theory of rationality should require, and what epistemology provides as such a theory.

This does not in itself, of course, establish that epistemology’s normative standards of rationality are without value. Rather, it only shows that they are limited in applicability. This may appear to be a reason for maintaining the traditional division between epistemology and broader studies of rationality.

However, we have yet to address the fact that a normative theory of rationality cannot require of an agent that she do what she is not capable of doing. Call this the *ought-can principle*. The ought-can principle provides additional reasons why normative standards of rationality must accommodate cognitive diversity through rational diversity. As mentioned above, normative standards of rationality are designed to govern or prescribe rational behavior relative to specific goals, and the achievement of specific goals require specific resources and capacities. Sometimes normative standards of rationality that govern the rational behavior of a specific sort of cognitive system relative to a specific goal will impose requirements that cannot be met by other cognitive systems. While such standards may be appropriate for systems that can meet these requirements, they cannot apply to systems that cannot due to the ought-can principle.

Below, I will examine what, if any, cognitive systems may be subject to epistemology's normative standards of rationality in light of the ought-can principle.

So far we have discussed two ways in which epistemology's normative standards of rationality are limited.³⁰ First, they only apply to cognitive systems that operate exclusively on linguistic representations, and aim at the goal of acquiring true beliefs. Second, they only apply to cognitive systems that are capable of meeting them. Both of these limitations are the direct result of cognitive diversity. In light of these limitations, below I will consider two options for reconciling epistemology and the lessons from cognitive science that give rise to cognitive and rational diversity.

The first option, which appears to be followed by philosophical tradition, is to keep epistemology separate from broader studies of norms of rationality. Under this option, the idea is that epistemology's job is to provide an analysis of propositional knowledge, i.e., to solve the analysis problem, as well as develop normative standards of rationality that should be adhered to by agents whose goal is acquiring propositional knowledge.

The second option is to revise epistemology so as to accommodate the lessons from cognitive science and demonstrate sensitivity to cognitive diversity. At first glance, it is not entirely clear how much revision acknowledging cognitive diversity requires. At the very least, reconciling epistemology with cognitive diversity will require an expansion of the current epistemological framework that operates in terms of propositional representations and a truth-directed construal of norms of rationality. One way in which this might be done would be to divide epistemology into sub-domains that

³⁰ These sorts of limitations will exist for any account of normative standards of rationality, though the focus here is simply the standards of rationality that are operative in epistemology.

correspond to various diverse types of cognitive systems. Perhaps in doing so, we would find that the current framework of mainstream epistemology will apply to one or some of these domains, that is, certain types of cognitive systems. On the other hand, if it turns out that mainstream epistemology's framework does not apply to any actual cognitive systems, the value of the current epistemological framework becomes questionable.

3.2. DOXASTIFICATION

However, before considering these two options for reconciling epistemology and cognitive science, I consider one way in which a proponent of traditional epistemology might try to argue that cognitive diversity does not require substantial revision in epistemology, which I call the *doxastification strategy*. More specifically, the strategy provides a way for an advocate of traditional epistemology to argue that apparent cases of non-propositional knowledge can be accommodated within epistemology's propositional framework. If such an argument succeeds, then this may provide a way for epistemology's traditional normative standards of rationality to accommodate cognitive diversity.

3.2.1 THEORETICAL BACKGROUND

In this section, I assume the truth of both representational pluralism and psychological representational pluralism.³¹ The strategy of my argument will be to show that these theses cast doubt upon *epistemological monism*, which is the thesis that all knowledge is propositional. I have argued in chapter 1 that epistemological monism has

³¹ See chapters 1 and 2 for full discussion of these theses.

been the running assumption in epistemology due to the field's focus on skeptical regress of reasons arguments, which trace their origins to the ancient skeptics, and due to the focus on the Gettier problem (Gettier 1963). I have referred to research programs in epistemology that focus on these two issues the *analysis problem*.

Let's suppose that I am correct and that the reason epistemology has operated under the assumption of epistemological monism is due to the fact that the analysis problem has been at the forefront of research in epistemology. While this supposition may provide some reason to think that we are in need of an argument for epistemological monism, it does not provide evidence that monism is false. Moreover, because monism is the running assumption in epistemology, it may seem that the burden of proof lies with those, such as myself, who endorse epistemological pluralism.

While I believe that representational pluralism, and its psychological variant are fairly non-controversial, the epistemological implications of these theses have not been given due consideration. For these reasons, my aim here is to argue that if representational pluralism and psychological representational pluralism are correct, then epistemological monism is implausible, and so epistemological pluralism should be the guiding assumption in epistemology.

Unfortunately, due to the general assumption of epistemological monism, there has been little to no work that seeks to develop a compelling case for the thesis. So in order to establish that the representational pluralist theses render epistemological monism implausible, I will present what I take to be the strongest argument for endorsing monism, and show that this argument has the consequence of turning knowledge,

justification, and evidence into hollow concepts. I label this argument the *doxastification strategy*.

The plan of this section is as follows. In the next subsection, I argue that representational pluralism and psychological representational pluralism, along with a bit of semantic evidence, provide a *prima facie* case for epistemological pluralism. In doing so, my goal is to place the burden of proof squarely on epistemological monism. This will set up the doxastification strategy as a response to this *prima facie* evidence for epistemological pluralism. After explaining and presenting doxastification, I proceed to show why the argument fails as a case for epistemological monism. I then go on to discuss a few implications of epistemological pluralism, and motivate the need for it to become the guiding assumption in epistemology.

3.2.2 A PRIMA FACIE CASE FOR EPISTEMOLOGICAL PLURALISM

On the assumption that knowledge is, in part, a cognitive activity or state, understanding cognition is a prerequisite for understanding the nature of knowledge. Psychological representational pluralism entails that many of our mental representations are non-propositional. For instance, the thesis allows that we have mental representations that are imagistic, scale models, auditory, motor sensory, maps, and so on. The thesis, of course, also allows that we have propositional mental representations.

Because I am assuming here that knowledge is a cognitive activity, and that understanding the nature of mental representations is a prerequisite for understanding the nature of knowledge, there is no obvious reason at the outset of our investigation why we should privilege one representational format as being the one and only format that can

instantiate knowledge. So if epistemology begins with what should be its appropriate prerequisite - understanding the nature of cognition and mental representation - and we hold that mental representation is pluralistic, epistemological pluralism is a more reasonable starting assumption than epistemological monism.

Now the fact that epistemology has focused almost exclusively on propositional knowledge due to concerns with the analysis problem should not be understood as an assumption of epistemological monism over pluralism. But this focus does show us at least two things relevant to the issue at hand. First, due to the nature of epistemology's history, epistemologists have focused primarily on knowledge that is represented in only one of the many representational formats that we have at our disposal. Second, the focus shows that epistemology has not attended to what I have identified as one of its prerequisites, that is, understanding the nature of cognition and mental representation. Perhaps at the beginning of epistemology's history, our best psychological theories held that cognition is exclusively propositional, and perhaps philosophers were aware of this at the time. But this historical fact, if it is one, does not establish that epistemology has succeeded in fulfilling this prerequisite. For fulfilling this prerequisite is something that must be done time and again whenever we have advances in our understanding of how the mind works and how it represents information. So even if epistemology at one time attended to this prerequisite, the current state of the field indicates that a recertification of sorts is in order.³²

To recap, the psychological *prima facie* case for epistemological pluralism is as follows. On the assumption that knowledge is, in part, a cognitive state or activity,

³² To their credit, many of the British Empiricists thought that mental representation was, at least in part, imagistic. Locke, for example, thought that our ideas of primary qualities resemble the qualities that they represent.

understanding cognition and mental representation should come before understanding or investigating knowledge specifically. On our current understanding of psychology, mental representation takes a variety of formats, many of which are non-propositional. There is no reason, at this point in the investigation, to assume that only one of these representational formats is the seat of knowledge. So, our starting assumption, after completing this preliminary psychological work, should be epistemological pluralism.

Since we are assuming that knowledge is a cognitive state or activity, psychological data should take precedence over semantic data when we are trying to understand the nature of knowledge. However, some epistemologists may think that, due to our semantic competence, looking at how the term “knowledge” and its cognates are employed by competent speakers provides us with important epistemological data. That is, rather than understanding the nature of cognition and mental representation before attempting to directly understand knowledge, we need to determine what the objects of knowledge must be in order to understand the semantics of sentences that ascribe knowledge to epistemic agents.

But even if semantics, rather than cognitive science, were the appropriate prerequisite for epistemology, the starting assumption should still be epistemological pluralism rather than monism.

Consider some locutions that provide some *prima facie* semantic evidence for epistemological pluralism:

- (1) Jones knows that a shot to the head killed JFK.
- (2) Jones knows how the New York City subway system is laid out.
- (3) Jones knows what the *Mona Lisa* looks like.
- (4) Jones knows what “God Only Knows” sounds like.

Only in (1) does the object of knowledge appear to be a proposition. In (2) the object of knowledge is the layout of a subway system, in (3) it is the appearance of a painting, and in (4) it is the sound of a song.

The semantic *prima facie* evidence for epistemological pluralism consists in the fact that we frequently attribute knowledge to epistemic agents where the objects of knowledge are not propositions, but other things, such as layouts of subway systems, something naturally represented by a map, or tunes to songs, something naturally represented in auditory memory or in a score. Neither of these can be represented with a comparable degree of accuracy or detail by sentences. If the motivation behind an appeal to this methodology is our semantic competence, then there is no reason to think that only sentences such as (1) reflect our competence, and that sentences such as (2) – (4), and other knowledge attributions that do not ascribe knowledge of propositions, fail to reflect our competence, but are some sort of performance error. In other words, the semantic evidence, just like the psychological evidence, indicates that epistemological pluralism, rather than monism, should be our starting assumption in epistemology.

For reasons discussed in chapter 2, psychology should take precedence over semantics when we are concerned with the referent of a psychological term, such as “knowledge,” or the concept to which it refers. However, in this case, the psychology and semantics appear to be in agreement, and thereby provide complementary evidence for epistemological pluralism.

The semantic evidence provides us with some indication as to what sorts of things qualify as objects of knowledge. Meanwhile, the psychological evidence provides us with some insight regarding how these objects of knowledge are mentally represented. When

we ascribe propositional knowledge to an agent, psychology tells us we have the means to represent this knowledge propositionally. When we ascribe non-propositional knowledge to an agent, psychology tells us that we have other, non-propositional, representational formats by which to represent this information. We can represent knowledge of the New York subway system with mental maps and we can represent knowledge of the tune of a song with auditory representations.

3.2.3 THE DOXASTIFICATION STRATEGY

Since monism appears to be the guiding assumption in epistemology, it may seem that the dialectical burden lies with those who advocate epistemological pluralism. In the previous section I aimed to shift this burden by arguing that understanding cognition and mental representation, as well as the use of “knows” and its cognates, should be prerequisites for doing epistemology and that these both suggest that our starting assumption should be epistemological pluralism rather than monism. If I have succeeded in shifting this burden, monism stands in need of a defense.

The doxastification strategy is a way in which a proponent of epistemological monism can mount such a defense. This strategy consists in offering a propositionalized, or doxastified, account of *prima facie* cases of non-propositional knowledge. While there has been no general discussion of the doxastification strategy, it has been applied in both epistemology and philosophy of mind. In order to illustrate and explain the strategy, I will discuss two such examples.

Jason Stanley and Timothy Williamson have used a version of the strategy to argue for intellectualism, that is, the thesis that knowing how to do something amounts to

propositional knowledge (Stanley and Williamson 2001; Stanley 2011a; Stanley 2011b). To support their position, they argue that knowledge-wh (i.e. *knowing where*, *knowing why*, *knowing when*, and *knowing how*) attributions are propositional knowledge attributions. Because I have offered a full discussion of Stanley and Williamson's treatment of knows-wh locutions in chapter 2, here I review only their discussion of know-how ascriptions.

Know how attributions are generally expressed by sentences of the form, "S knows how to X." In sentences of this form, the object of S's knowledge appears to be, not a proposition, but a procedure for, or way of, X-ing. So these sorts of sentences appear to provide *prima facie* semantic evidence for epistemological pluralism, just as (1) – (4) do. Since the semantic evidence suggests that the object of knowledge is a procedure, we can turn to psychology to see how things of this sort are mentally represented. Here, the nature of the mental representation will likely depend on the specifics of the procedure. Certain procedures may be such that they can be represented propositionally (e.g. procedures for doing long division³³), whereas others may not (e.g. procedures for playing tennis).

Stanley and Williamson apply the doxastification strategy to this *prima facie* instance of non-propositional knowledge by arguing that when we attribute knowledge of an embedded question (e.g. "how to X") to an agent, the object of knowledge is a proposition that answers the embedded question (e.g. a way of X-ing). On their view, sentences of the form, "S knows how to X" ascribe to S knowledge *that* some way w is a

³³ Though even here it may depend on the specifics of the procedure. Learning long division typically involves learning things such as how to properly align the digits. Children with exotropia, a form of strabismus in which the eyes are deviated outward, often have difficulty properly aligning digits, and thereby make errors. This suggests that visual percepts play an important role in doing long division in this manner.

way for her to X.³⁴ In short, Stanley and Williamson are providing an account of a know-how attribution under which it is a propositional knowledge attribution. They are doxastifying knowledge how.

Another application of the doxastification strategy is found in Cummins et al's (2013, 6) discussion of *content-demonstrating speech acts*, of which the following is an example:

(5) Beethoven looked like this:



A content-demonstrating speech act has two basic components: a linguistic component that contains a demonstrative (e.g. "Beethoven looked like this.") and a representation that is introduced by the demonstrative (e.g. the black and white picture of Beethoven). The linguistic component can function to introduce different sorts of representations, such as images, maps, and graphs, as well as further linguistic representations. In other words, the linguistic component containing the demonstrative specifies a target for the representation being introduced, and the result is true if and only if the representation accurately portrays the specified target.

Note that (1) – (4) from above can be rephrased as knowledge attributions of the contents of content-demonstrating speech acts, as follows:

³⁴ As I have discussed elsewhere, in order for S to know how to X on Stanley and Williamson's view, she must also entertain her knowledge that w is a way for her to X under a practical mode of presentation. As far as I can tell practical modes of presentation are not relevant to the doxastification strategy, so here I focus only on the propositional knowledge component of Stanley and Williamson's position. For a more detailed discussion see chapter 2.

- (1*) Jones knows that JFK was killed like this: he was shot in the head.
- (2*) Jones knows that the New York City subway system is laid out like this: [map of NYC subway system]
- (3*) Jones knows that the *Mona Lisa* looks like this: [picture of the mona lisa]
- (4*) Jones knows that “God Only Knows” sounds like this: [audio of song]

Cases in which one knows a content-demonstrating speech act in which the introduced representation is non-propositional, such as (2*) – (4*) and (5) provide further evidence for epistemological pluralism. In these cases, the object of knowledge is, in part, a non-propositional item introduced by a demonstrative. Following psychological representational pluralism, these non-propositional items are mentally represented in non-propositional formats. So, if the object of one’s knowledge is that which is expressed by a content-demonstrating speech act that contains a non-propositional element, and knowledge is a certain cognitive state, i.e. a certain type of mental representation, then the non-propositional component of what one knows in these cases is constituted by a non-propositional mental representation. In short, these appear to be cases of non-propositional knowledge.

However, a proponent of epistemological monism may apply the doxastification strategy by arguing that when we attribute to someone knowledge of a content-demonstrating speech act, the object of knowledge is the truth-condition of that speech act, which is a proposition. So even in cases where the content-demonstrating speech act contains a non-propositional element, what is known is a just a proposition, namely, the truth condition.

Let’s consider some examples. As Cummins et al (2013) note, (5)’s truth condition can be expressed as follows:

- (5a) The picture introduced is an accurate representation of what Beethoven looked like.

The truth conditions for (1) – (4) can be expressed as follows:

- (1a) The sentence introduced is an accurate representation of how JFK was killed.
- (2a) The map introduced is an accurate representation of New York City's subway system.
- (3a) The picture introduced is an accurate representation of the *Mona Lisa*.
- (4a) The sequence of sounds introduced is an accurate representation of "God Only Knows."

So doxastifying knowledge that (5) will amount to arguing that when we say that someone knows (5), the knowledge being ascribed is knowledge that (5a) is the case. In other words, knowing (5) is, despite impressions to the contrary, propositional knowledge. In the same way, (2*) – (4*) can be doxastified by arguing that they are knowledge attributions of the propositions expressed in (1a) – (4a), that is, attributions of propositional knowledge.

3.2.4 AGAINST DOXASTIFICATION

In the previous section we looked at two applications of the doxastification strategy. In this section, I argue that the doxastification makes for bad epistemology by divorcing the notions of justification, evidence, and knowledge from the content that does genuine evidential and epistemic work.

To illustrate the problem with doxastification, let's begin by focusing on (5) and (5a). Recall that knowing (5) seems, *prima facie*, to be a case of non-propositional knowledge because the apparent object of knowledge is not a proposition, but rather the content of an image. But according to doxastification, when one knows (5), one's knowledge consists not in an image, but in the proposition that is the truth condition for (5), namely, (5a).

As Cummins et al (2013) note, one can know the truth condition of (5), (5a), without having a clue what Beethoven looks like. A blindfolded person can point to the image and confidently assert, “Beethoven looked like this,” just as long as they have been told that the picture at which they are pointing is an accurate picture of Beethoven. In other words, one can know the truth condition for (5) without having any information at all about Beethoven’s appearance, beyond the fact that it is accurately represented in the indicated picture. To have information about Beethoven’s appearance, one needs to have access to the content of the picture (or the content of some other picture of him that is sufficiently accurate). As Cummins et al put it, “Since the content of the picture introduced is not part of the specification of the truth condition, knowledge of the truth condition does not provide the relevant access,” (2013, 7).

It is important to note that things are different when the representation introduced by a content-demonstrating speech act is a linguistic representation, as in (1). This case is the same in that one can know the truth condition for (1), (1a), without having a clue how JFK was killed because (1a) does not provide access to the content of the representation in (1) (“he was shot in the head”). But this case is different from the Beethoven example because here we can replace (1a) with a linguistic representation that does provide access to the relevant information, such as (Cummins et al 2013, 7):

(1a*) A shot to the head killed JFK.

Since (1a) obtains just in case (1a*) obtains, it might seem that the lack of access to the relevant information provided in (1a) is not epistemologically significant.

In this case, the availability of (1a*) does indeed make the lack of information in (1a) epistemologically insignificant. This is because the relevant representation in this

case is a *linguistic* representation. That is, there is a clear way to incorporate the relevant information into the specification of a linguistically expressed truth condition. But since the content of the representation in the Beethoven case is *not* linguistic, it cannot be part of a truth condition. There is no linguistic representation that contains the information contained in the picture, and so there is no linguistically expressible truth condition that can contain this information. This is a straightforward consequence of and hence evidence for, representational pluralism (Cummins et al 2013).

One might be tempted to argue that the Beethoven example, and other similar cases, actually lends support to epistemological monism. The idea is that because one can know the truth conditions of the content-demonstrating speech acts contained in (2) – (5) without having access to the non-propositional representations that are demonstratively introduced, this shows that knowledge does not require any non-propositional components, even in cases where the apparent object of knowledge is not a proposition. These sorts of cases further show, according to this line of argument, that even when one does have access to the non-propositional representations, this access is in no way epistemologically essential because one can know the relevant propositions (i.e. the truth condition of the content-demonstrating speech acts) without having this access.

However, this illustrates just why taking these cases to be supportive of epistemological monism is mistaken. While one can know the truth condition of a content demonstrating speech act without having access to the representation introduced by that act, knowing this truth condition requires that *someone* has access to the relevant representation. In cases where one knows the truth conditions of content-demonstrating speech acts that have a non-propositional representation, without having access to the

representation, one's evidence or justification for this knowledge comes by way of a linguistic report. In the Beethoven case, one has to be informed by a reliable source that the picture introduced accurately represents what Beethoven looked like. Of course, it is not necessary that one's informant have access to the information contained in the picture. Perhaps the informant is in the same position as the informed. But in order for an evidential testimonial chain to be generated in the first place, at some level there must be a source of evidence that does have access to the information contained in the picture. After all, the reason that the picture is an accurate representation of Beethoven is due to the content of the picture. So where one knows that the picture is an accurate representation of Beethoven without having access to the content of the picture, one's justification is parasitic on a source that does have this access.³⁵ In this sense, having access to non-propositional representations introduced in content-demonstrating speech acts *is* epistemologically essential.

Of course, we often come to know propositions through visual perception, so it is important to see why the Beethoven case, and others like it, is different from ordinary cases of propositional knowledge by visual perception. We often know or believe things on the basis of what we see and this knowledge or belief is often of the sort that seems to be non-controversially propositional. I know that my shirt is brown because I see that it is brown. I know that my cat is looking out the window because I see her looking out the

³⁵ This same issue arises in Stanley and Williamson's discussion of know-how. While they hold that knowing how to X entails knowing that some way is a way for one to X, they acknowledge that one can know that some way is a way for one to X without knowing how to X. Although the case they discuss is one in which the agent does have access to the item being introduced demonstratively, the case can be altered such that this access is no longer available which makes the case similar in all the relevant respects to the Beethoven example. See chapter 2 for a more detailed discussion of these issues.

window. *My shirt is brown* and *my cat is looking out the window* are clearly propositions, even if I come to know them through visual perception.

Part of the issue here is that language can be deceiving. ‘See’, ‘hear’ and ‘feel’ can take propositional complements (e.g. I *see* that my cat is looking out the window). But this linguistic usage does not establish that percepts are expressions of propositions, or that they can be or are mentally represented in the way that propositions are. We can certainly infer propositions on the basis of visual, or other types of, perception. But the content of a proposition inferred in this way is not the same as the content of the visual, or other, percept that was the basis of the inference. Percepts are like other non-propositional representations, such as pictures, maps, recordings, and scale models, in that they can be more or less accurate representations of their targets, but are not evaluable using truth-conditional semantics (Cummins et al 2013).

In the Beethoven case, (5) is true because the picture introduced is an accurate representation of what Beethoven looked like. But the reason that this truth condition obtains has to do with the content of the picture, and its structural relationship to Beethoven’s appearance. As (5a) shows, we can *report* this accuracy propositionally, but this linguistic report is not doing any of the evidential work, nor is it *representing* the content of the picture and its structural relationship to Beethoven’s appearance. In order to assess whether a picture, or another non-propositional representation, is accurate, we need access to a genuine evidential relationship between the representation and its target. This is a prerequisite for accurately reporting linguistically that, for example, the picture introduced is an accurate representation of what Beethoven looked like.

What the Beethoven case and others like it shows is that we can come to know that a non-propositional representation is accurate with respect to its target without having access to the content of the representation. This generally, if not always, occurs through receiving a linguistically expressed report that the representation is indeed accurate. While this may amount to justification or evidence of a sort, it is a rather weak form of justification that is parasitic on a source that has the information that does the genuine evidential work, namely, the content of the representation under consideration and its structural relationship its target.³⁶

Moreover, the fact that one can know that a representation accurately represents its target without having access to the content of the representation (or to the target, i.e., the thing being represented) supports epistemological pluralism. To continue with the example, the fact that one can know that the image in (5) is an accurate representation of Beethoven without having clue what Beethoven looked like shows that knowing what Beethoven looked like is knowledge that is not propositional.

This type of support for epistemological pluralism does not come only from cases where one knows the contents of a content-demonstrating speech act that contains a non-propositional representation. Recall the examples I mentioned above of propositional knowledge by way of visual perception. I know that my cat is sitting on the window because I see her sitting there. I know that my shirt is brown because I see that it is brown. In these cases, my evidence for these propositions consists in my visual percepts, as well as perhaps some background knowledge or beliefs. But of course, in these cases

³⁶ Often times the evidence that links a representation to its target is quite complex. For instance, when we look at a picture of Beethoven, we are not in a position to assess the structural relationship between the picture and Beethoven's actual appearance because we do not have access to the latter. Rather, we typically just assume that the representation does indeed accurately depict, or otherwise represent, its target.

one can know these propositions without the aid of visual percepts or pictorial representations. All I need to do is to linguistically report them to you, who are in the next room. And of course this knowledge can continue to spread by others making further linguistic reports. But these cases are like the Beethoven case in that ultimately the justification for this propositional knowledge consists in genuine evidential relationships between percepts and their representational targets. When I say that, “I see that my cat is looking out the window,” what is really going on is that I infer this proposition on the basis of visual perception, just as I infer the proposition that my shirt is brown on the basis of visually perceiving its color. There is information represented by my visual percepts that is not a part of the content of the propositions I infer on the basis of these percepts.

Doxastification is equally problematic when Stanley and Williamson apply it to argue that knowing how is a form of propositional knowledge. Recall that on their view, knowing how to X is propositional knowledge because it amounts to knowing that some way is a way for one to X and entertaining this proposition under practical mode of presentation. But, as discussed above, one can know that some way is a way for one to X without knowing how to X, or without having any idea of what the way of X-ing amounts to. One only needs to be told that some way is a way for one to X. This is illustrated through a modified version of one of their examples which was discussed in chapter 2:

Suppose that Hannah does not know how to ride a bicycle. Susan, Hannah’s friend, points to John, who is riding a bicycle, and says, ‘That is a way for Hannah to ride a bicycle’. Suppose that the way in which John is riding his bicycle is in fact a way for Hannah to ride a bicycle. Susan, who is known to be a reliable source of information, calls Hannah, telling her, “I saw John riding his bicycle earlier, and you know what? The way in which he rode is a way for you to ride your bicycle.”

Where ‘that way’ and ‘the way in which he rode’ refer to John’s way of riding a bicycle, Hannah comes to know that that way is a way for her to ride a bicycle, but does not come to know how to ride a bicycle.

Now Stanley and Williamson hold that the issue here is that Hannah has not entertained this proposition under a practical mode of presentation, which is, on their view, necessary for knowing how. Yet they do not hold that introducing the notion of practical modes of presentation is incompatible with know how being propositional knowledge. I have argued in chapter 2 that in order for practical modes of presentation to do the work Stanley and Williamson need them to do, positing them must amount to positing non-propositional knowledge. I will not repeat these arguments here.

What is relevant to the present discussion is that what makes it true that some way is a way for Hannah to ride a bicycle is that there is a certain fit between a way of riding a bicycle, and a way *for Hannah* to ride a bicycle. Here things are more complicated than in the Beethoven example because it is unclear what sorts of relationships constitute the appropriate sort of fit between a way of X-ing, and a way for some person, S, to X. But what is clear is that a way for some person, S, to X is a way of X-ing. So in order to have knowledge of a way of X-ing, one will need a representation, mental or otherwise, that accurately represents a way of X-ing. In the case of bicycle riding, it is highly implausible that a linguistic representation can capture the content of a way of bicycle riding. There is a good deal of information that is plausibly relevant to bicycle riding that is non-propositional in nature, such as visual information, motor-sensory information, kinesthetic information, and perhaps more. At the very least riding a bicycle requires a motor program that is integrated with perceptual inputs. It is simply a consequence of

representational pluralism that this sort of information cannot be represented in a linguistic format. Moreover, it is plausible that propositional knowledge is not only insufficient for bicycle riding, but unnecessary as well. Some dogs can ride bicycles. If dogs do not have propositional mental representations, then they certainly don't know that some way is a way for them to ride bicycles. But it seems clear that some know how to ride, while others do not, and those that do know how have learned to do so.

There may be some things that we know how to do, where ways of doing those things can be represented propositionally. But bicycle riding appears to be at least one case in which know-how is non-propositional. Attempting to doxastify know-how decouples the information that is central to knowing-how to do something from purported instances of knowing-how.

To conclude this section, the doxastification strategy is a way in which a proponent of epistemological monism argues that apparent instances of non-propositional knowledge are actually cases of propositional knowledge. When one knows what something looks like, doxastifiers claim that what one knows is that a representation accurately represents the appearance of the object under consideration. When one knows how to do something, doxastifiers claim that what one knows is that some way is a way for one to do that activity. But the reason that these propositions are true, when they are true, is that a genuine structural and evidential relationship exists between the representation and its target, whether that target is an appearance, a subway system layout, a song, or a way of doing something.

Doxastification turns knowledge, justification, and evidence into weak concepts that are divorced from the content that does the genuine evidential work. If we didn't

have this information or content, then many of our claims to propositional, not to mention non-propositional, knowledge could never get off the ground. We know what Beethoven looks like, and this is because we have access to representations that accurately represent his appearance. We also know that these representations accurately represent his appearance because we, or someone else, have access to the structural relationship that obtains between these representations and their target. We can *refer* to these relations and representations linguistically, but evidence is at bottom a representational affair, and reference is not representation.

3.2.5 IMPLICATIONS OF EPISTEMOLOGICAL PLURALISM

In the previous section I argued that doxastification makes for bad epistemology because it divorces the notions of knowledge, justification, and evidence from the content that does the genuine evidential and justificatory work, as well as the content that is central to our knowing various things. Since doxastification, as I have laid it out, is a response to *prima facie* evidence for epistemological pluralism, and since doxastification makes for bad epistemology, we should explore the implications of epistemological pluralism.

Perhaps the most obvious implication of epistemological pluralism is that knowledge is not always something that has the property of truth.³⁷ Many representational formats are not assessable by truth-conditional semantics, and must instead be assessed for accuracy across various, often times competing, dimensions. However, it is important

³⁷ Even in cases in which a belief is comprised of non-linguistic representations, it is only the belief that is true or false. The images, for example, that comprise the belief do not have truth-values.

that we understand that we cannot simply substitute talk of accuracy for talk of truth, where it may appear appropriate to do so.

Under the traditional epistemological framework, knowledge is binary – you have it or you don't. Often times, this question will be settled by whether the proposition under consideration is true or false. But under epistemological pluralism, we have to make room for knowledge that is represented non-propositionally. These representations must be assessed for accuracy rather than truth. But unlike truth, accuracy is graded rather than binary. Whereas propositions are true or false, images, maps, scale models, and so on, can represent their targets to various degrees of accuracy. This becomes even more complicated because in order to represent a target accurately across one dimension, a representation will often have to sacrifice representing its target accurately in another dimension. The Mercator projection, for example, being a conformal projection preserves angles across all locations at the cost of distorting the size of geographical objects and the Earth's overall geometry. A consequence of this sort is a necessary consequence of representing a globe in two dimensions.

So far it may appear that the broader concept of knowledge that we need under epistemological pluralism will be something like *evidential accurate representation* (as opposed to *justified true belief*). However, since accuracy is graded, rather than binary, we might think that a certain degree of accuracy is required in order for an evidential representation to qualify as knowledge. In other words, we might think the broad concept of knowledge that we need under epistemological pluralism is *evidentially sufficiently accurate representation*.

Unfortunately, there are at least a couple of problems with this approach. First, it is not at all clear how we would go about determining the threshold for *sufficient* accuracy. Moreover, since increased accuracy along one dimension often comes at a cost of decreased accuracy along another, if knowledge were *simply evidential sufficiently accurate representation*, this would appear to require our arriving at a notion of *overall accuracy* that accounts for accuracy trade-offs across competing dimensions. I am not certain whether such a project is hopeless, but the prospects seem grim.

One way to address this issue, albeit to a limited extent, is by introducing the notion of *effectiveness*. While this notion will not allow us to arrive at a notion of overall accuracy, it may serve the function of helping us to determine which dimension of accuracy is most relevant to the problem under consideration. While the Mercator projection distorts the sizes of geographical objects, it is effective for marine navigation because it represents rhumb lines, that is, lines that make constant angles with the meridians, as straight segments. Of course, since rhumb lines and meridians are not actual features of the Earth, the Mercator projection might be understood as generally less accurate than other representations of the Earth, such as globes. However, it is more effective when the goal at hand is marine navigation. On the other hand, when we are concerned with the relative sizes of geographical objects, a globe is more effective than the Mercator projection.

Due to the fact that accuracy, unlike truth, is graded, one implication of epistemological pluralism appears to be that we will have cases in which one agent knows something better than another. If A and B both have mental images of Beethoven, but A's image is more accurate than B's, it seems we can conclude that A knows better

than B what Beethoven looked like. But due to the complications that come along with the introduction of accuracy and effectiveness, it may be impossible to supply any general criterion by which we can assess when one agent knows something better than another. This is not to say that epistemic assessment becomes impossible; rather it becomes multifaceted, task-specific, and goal-relative. Instead of simply judging that A knows something better than B, we may have to describe how each agent works, how relatively accurate their representations are across the relevant dimensions, and their merits and drawbacks with respect to a variety of goals.

Let's return to the predator detection example from chapter 3. Suppose that we have two agents, A and B, who go about identifying predators in different ways. While A and B both identify predators using visual cues, A quickly infers that an object is a predator based on only a few cues while B waits until significantly more cues are present before it will infer that an object is a predator. Relative to the goal of simply *identifying* predators, B will fair better than A. In other words B will identify more predators as predators than A will. But relative to the goal of predator avoidance and survival, A will fair better than B, particularly in cases where time is of the essence. When an object is indeed a predator, A will engage in avoidance behavior during a time at which B is still awaiting further cues.

In this case, it does not appear that we can say whether A or B's knowledge is "better." However, we can say that, with respect to the goal of predator avoidance, although B's knowledge is more accurate, it is less effective than A's. With respect to the goal of predator identification, when time and predator avoidance are not relevant, it may be that B's knowledge is both more accurate and more effective.

The graded nature of accuracy suggests that epistemic assessment, under epistemological pluralism, requires notions of knowledge that is “better” or “worse.” But as the predator detection and Mercator projection examples show, this is deeply complex. The notion of better (or worse) knowledge is going to have to be indexed to something or other. If it is claimed that one agent’s knowledge is better than another’s, we should ask, “Better for what?” Better for understanding the Earth’s actual geographical structure? Better for marine navigation? Better for identifying predators, or better for avoiding them?

Trading one representational resource for another will always come with costs and benefits. We have already seen this with the predator detection and Mercator projection cases. But there are plenty of other instances as well. Some representational resources will benefit an individual’s biological fitness without benefiting the individual. Some tradeoffs will benefit tractability at the cost of accuracy, such as NASA’s use of Newtonian mechanics, rather than relativity theory, to compute escape velocities. Still other tradeoffs will benefit communicability at the cost of accuracy, such as using language to describe something that is more accurately represented in another format, such as depiction.

Still, effectiveness relative to a specified goal or function cannot be the sole criterion for epistemic assessment under epistemological pluralism. We will, after all, still need a way to distinguish non-propositional knowledge from mere non-propositional mental representations. It seems plausible that there will be cases in which the most effective strategy would be to rely on mental representations that are so structurally dissimilar from their targets that it would be unreasonable to call them accurate in any

sense. Perhaps there are other criteria that will allow us to distinguish non-propositional knowledge from mere non-propositional mental representations, At present, it is not clear to me what these would be, and so perhaps some minimal threshold of accuracy will be required. What these minimal threshold amounts to may vary across various epistemic domains.

The point to all of this discussion is that epistemic assessment is no simple matter under epistemological pluralism. Under pluralism, knowledge is not only pluralistic, but stratified (see Cummins et al. 2004). Epistemology must become more fragmented and specialized in the way that science has. It would be unreasonable to hold that science has taken a step backwards by becoming fragmented or stratified. This fragmentation is simply a product of scientific advancement. Fragmentation can advance epistemology in a similar manner.

It is beyond the aim of this chapter to give a full account of what epistemic assessment looks like under epistemological pluralism. But it should be clear that traditional approaches to this issue are not applicable.

3.2.6 CONCLUSION

In this section I have argued that, from a pre-theoretic, i.e. a pre-epistemological, standpoint, both cognitive science and semantics provide prima facie support for epistemological pluralism. I then suggested that the doxastification strategy is among the strongest or most natural ways to respond to this prima facie support for pluralism. However, due to representational pluralism, doxastifying prima facie cases of non-propositional knowledge divorces the genuine evidential or justificatory content from

traditional philosophical accounts of knowledge and justification, i.e., epistemological monist accounts. In other words, in light of representational pluralism, doxastification and epistemological monism reduce knowledge and justification to hollow notions that are parasitic on the, often non-propositional, representations and contents do the real work. For these reasons, doxastification makes for bad epistemology. In the final section I began to sketch some of the implications of epistemological pluralism. While this project is far from complete, the troubling consequences of epistemological monism and doxastification illustrate the need for epistemologists to give the implications of epistemological pluralism serious attention.

3.3 OPTIONS FOR RECONCILING EPISTEMOLOGY WITH COGNITIVE SCIENCE

In the previous section, I considered one way in which a proponent of traditional epistemology might try to argue that there is no need for a reconciliation between cognitive science and epistemology.

In section II I laid out two ways in which we might reconcile the current state of mainstream epistemology with cognitive diversity. These are:

- (a) Divorce epistemology, understood as the theory of knowledge, from the study of norms of rationality and the assessment of cognitive systems, broadly construed.
- (b) Revise epistemology to accommodate cognitive diversity and the lessons from cognitive science.

My own preference is to pursue the latter option. However, the first should not be simply dismissed. In this section, I provide reasons for pursuing (b) over (a).

3.3.1 DIVORCING EPISTEMOLOGY FROM THE STUDY OF RATIONALITY

Cummins et al. (2004) note that, under the tradition we have inherited in philosophy, “epistemology proper” is treated as being distinct from the broader study of rationality. Epistemology proper focuses on propositional knowledge and the evidential justification of belief, whereas the broader study of rationality focuses on questions of practical reason and rational action, in addition to rational belief.

On Cummins et al.’s view, epistemology overlaps with, but does not encompass, the broad study of rationality. Cognitive science should force us to account for the fact that a great deal of cognitive activity is not inference among propositional attitudes. We must be sensitive to representations that are more or less accurate across various dimensions, and the processing of representations of this sort cannot be captured in terms of propositional representations and logical inference. Epistemology’s propositional framework places a limit on the sorts of cognitive activity that it is in a position to evaluate. For this reason, Cummins et al argue that we need to account for cognitive diversity by way of diversity among “rules of right reason,” and that mainstream epistemology is ill suited for this task (2004, 289). We need standards of rationality that go beyond the limits imposed by a propositional framework.

While Cummins et al use “epistemic” and its various cognates in discussing rational diversity, they take it that the subject matter of their project is rationality rather than knowledge, though they hold that this notion of rationality is to be understood broadly as epistemic constraint satisfaction. The idea is that epistemology does bear on questions of getting things right or wrong, doing better or worse, and this is what allows us to assess diverse cognitive systems in terms of rationality.

While I have described the option that CPR seem to be pursuing as divorcing epistemology from the study of rationality, this label may not be fair, even if what is at issue is merely terminological. CPR do seem to take their subject matter to be epistemology of a sort, but a type of epistemology that is distinct from, or broader than, issues surrounding philosophical accounts of propositional knowledge. So if we think of epistemology as the theory of *propositional* knowledge, then Cummins et al are not engaged in epistemology. But if we think of epistemology more broadly, then it is possible that there is a good deal of epistemic subject matter that does not have anything to do with propositional knowledge, at least not directly.

So the issue of whether Cummins et al are in fact divorcing epistemology from the broader study of rationality may be a terminological one. But even if this is right, I worry that their approach concedes too much to traditional epistemology. If knowledge is anything more than an abstract or ideal philosophical notion, then it is something that can be, and surely is, possessed by actual cognitive systems. If epistemology is to have as its subject matter something that exists in the world, then its subject matter should be understood as a cognitive state, that is, a state realized by actual cognitive systems. CPR acknowledge this point, saying that the rationales that are realized as the disciplined processing of non-truth-evaluable representations “are not expressible in the idiom of logic or of the propositional attitudes, and that implies that traditional epistemology has little to tell us about the Rules of Right Reason as those are actually found in nature and culture,” (2004, 289).

Here, Cummins et al are surely correct, and this point might tempt one to think that a naturalistic study of rationality needs to be divorced from epistemology. But the

worry is that this move would leave no real world subject matter for epistemology. On the assumption that knowledge is manifested in actual cognitive systems, there are rules of right reason that apply to the sorts of reasoning that give rise to knowledge. But if mainstream epistemology has little, or perhaps nothing, to tell us about the *rules of right reason* as they are actually found in nature and culture³⁸, this should motivate friends of naturalistic approaches to cognition, not to abandon epistemology, but to revise the field such that it is constrained by what science has told us about the nature of cognition.

3.3.2 RECONCILING COGNITIVE DIVERSITY AND EPISTEMOLOGY

Cummins et al are engaged in a project that is broadly concerned with the study of rationality and goes beyond the boundaries of traditional epistemology. I propose, rather, that we begin thinking about how to broaden epistemology, such that is more closely aligned with broader studies of rationality and a scientific understanding of cognition. Following Cummins et al, I propose we think of rationality as epistemic constraint satisfaction. This provides a framework from which we can develop an epistemology that is sensitive to cognitive diversity.

Above, I discussed two ways in which epistemology's normative standards of rationality are limited in scope: First, they only apply to cognitive systems that are exclusively propositional, and second, they apply only to cognitive systems that are capable of meeting them. In what follows, I examine the prospects for applying epistemology's normative standards of rationality to a variety of types of cognitive

³⁸ The institution of science, understood as a part of culture, might be close to being the sort of cognitive system to which the norms of rationality of traditional epistemology apply. However, the widespread use of non-propositional representation in science renders this questionable. This issue will be discussed in greater detail below.

systems. This examination potentially provides a reason, distinct from the doxastification strategy, for preserving epistemology's normative standards of rationality. However, if we find that there are no cognitive systems to which these standards apply, then this may provide a reason for abandoning these standards altogether.

I begin by looking at the prospects for applying epistemology's normative standards of rationality to what may seem to be their most obvious target, namely, individuals, understood as adult human beings. From the get go, these prospects do not appear to be promising as cognitive science has shown us that human beings are not exclusively propositional cognitive systems. However, I set this concern aside in the course of discussing human beings potential candidates for epistemology's standards of rationality, focusing solely on the question of whether these standards can apply to us without violating the ought-can principle. In a later section, I take up the prospects for applying epistemology's normative standards of rationality to the institution of science, understood as a cognitive system. There I will assume that these standards can be so applied without violating the ought-can principle, and focus on the use of non-propositional representations within science.

3.4 EPISTEMOLOGY'S RATIONALITY APPLIED TO INDIVIDUALS

In this section I argue that applying epistemology's normative standards of rationality to individual adult humans violates the ought-can principle. These standards of rationality fail to demonstrate a sensitivity to resource constraints to which we are constantly subject, namely, those of time and memory. If this is correct, then we will need to find another candidate for these standards in order to preserve their import.

It may seem that at bottom, epistemology's normative standards of rationality simply require that we form beliefs in a way that is sensitive to evidence, which does not seem to violate the ought-can principle. Rather, it would seem that such an activity is commonplace, and thereby something that we have the resources to do. So in order to see why epistemology's normative standards of rationality are problematic when applied to individuals in light of the ought-can principle, we need to investigate some of the details of these standards, and the manner in which they have come to be formulated.

As discussed in the first chapter, as well as above in this chapter, the account of truth-directed rationality that emerges from epistemology violates the ought-can principle by being formulated in hypothetical, abstract, and sometimes idealized conditions that abstract away from various real world constraints to which we are constantly subject. If we consider, for example, how an ideally rational agent might approach a given scenario, we will set aside concerns pertaining to the limits of human memory, temporal deadlines, the speed at which we can process information.³⁹

Note that this amounts to two dimensions of abstraction. First, we can abstract away from our limitations, such as limits to working memory, or the limited speed at which we can process information. This leads to the tendency to formulate normative standards of rationality that require that we do things that go beyond our limitations, that is, standards that violate the ought-can principle. Second, we might abstract away from constraints that are built into the problems with which we are concerned. This may be a violation of ought-can as well, but more importantly, this type of abstraction changes the very problem under consideration.

³⁹ We also tend to set aside concerns regarding the kind of information – both its form and content – that we can effectively process. This practice will be discussed in detail in a later section.

One might think that even though we are often restricted by memory or computational power, this is not a problem for the picture of rationality that is in play in epistemology. Rather, all this shows is that we engage in a good deal of activity that is not epistemic, and perhaps this activity is not subject to the sorts of norms I have been discussing. Epistemology's job is to articulate norms of rationality that need to be followed to arrive at knowledge, and we certainly engage in many pursuits that do not have knowledge as an end. But there is no reason why epistemology should be held accountable for not engaging in projects that fall outside of its domain.

This response may come naturally to proponents of the way in which epistemology has been conducted over the last several decades. As discussed above, epistemic constraints, that is, constraints that must be met in order for a system to be rational, have to be formulated in terms of a particular goal or set of goals. The proponent of standard of epistemology will hold that the epistemic constraints that are being articulated in epistemology are appropriate for agents whose goals are forming justified beliefs and acquiring propositional knowledge. It is for this reason that there is a traditional distinction between mainstream epistemology and broader studies of rationality. Whereas epistemology can evaluate rationality in terms of the goal of belief formation, broader studies of rationality assess performance when different goals are being pursued.

However, this response runs afoul of the observation noted in the first chapter that theorizing is generally conducted in the service of action or practice. In articulating norms of truth-directed rationality in epistemology, the assumption is that the goal is the pursuit of truth, which is why we want beliefs that are justified. But more often than not,

we develop theories not purely for the pursuit of truth, but for effectiveness in regards to various non-truth-aimed ends. When theorizing is done for this reason, it should not be evaluated in terms of its truth-conduciveness, but rather, in terms of how effectively it serves the action with which we are concerned. In other words, theorizing of this sort should be evaluated by normative standards of practical, rather than truth-directed, rationality.

Again, the proponent of standard epistemology has a reply waiting in the wings. Sure, we often develop theories that are useful for accomplishing our ends and often these ends don't have to do with arriving at truth. But again, these cases of theorizing fall outside of the domain of epistemology, and are more properly governed by a broader study of rationality, which covers practical, rather than truth-directed, reasoning. When theorizing is done in the service of action, this falls in the domain of practical reasoning. But when theorizing is done in order to get at truth, this falls in the domain of traditional epistemology.

Given the responses we have considered on behalf of the proponent of traditional epistemology, let's take stock of what the scope appears to be of the normative standards of rationality that are in play in the field, and to which sorts of cognitive systems they could apply without violating the ought-can principle.

First, recall that epistemic constraint satisfaction provides norms for assessing cognitive systems for good or correct performance. Quality of performance is goal relative. So the first condition for the applicability of epistemology's norms of rationality is that one's goal must be the pursuit of truth, perhaps by way of justified beliefs. But generally, when we are interested in getting at the truth about some matter, we must be

sensitive to other goals that we have as well and the constraints that come along with these. Even when we are engaged in what might be understood as purely truth-aimed projects, these generally have deadlines.⁴⁰ If these deadlines were not in place, it might be ideal to take more time engaging in research, or seeking out more evidence. But eventually we must settle with what we have, even when the evidence is incomplete.

One might respond by granting that the idealized, truth-directed standards of rationality embedded in epistemology do violate the ought-can principle, and thereby lose their normative force for creatures like us while maintaining that they are still useful because they provide us with an, admittedly ideal, goal to strive for. In other words, they lay out what epistemic constraints would be satisfied by an ideal agent, and being an ideal rational agent is something we should try to do, even if we can never complete the task. It is not, after all, uncommon for us to strive for goals that we can never meet. A dedicated hitter in baseball will strive for the goal of getting on base at every at bat, that is, the goal of being an ideal hitter. But of course no hitter can reach base at every trip to the plate, and so the standards that we use to evaluate actual hitters will be different than the standards that would be met by a hypothetical ideal hitter (This is why one qualifies as a excellent hitter by having an on base percentage of .400). Analogously, we should think of the standards of rationality in epistemology as providing goals to aim for, the idea being that we can become better epistemic agents by so aiming. And just as we use different criteria for assessing hitters than the standards that would be met by an ideal

⁴⁰ In these circumstances, the goal might be described as determining what one ought to believe given the evidence of which one is currently aware. This, of course, does not require seeking out new evidence or taking inventory of one's memory or background knowledge and beliefs. It may appear that truth-directed rationality can serve as a useful guide in such cases. The problem is that standards of truth-directed rationality are formulated in, and thereby designed to apply in, contexts in which no practical qualifications are in place. That is, contexts in which the goal is to determine what one ought to believe, not determine what one ought to believe *given the evidence of which one is currently aware, ignoring new evidence*. When this qualification is eliminated, the very problem itself is changed.

hitter, we can use different criteria for evaluating epistemic agents than the standards that would be met an ideal agent. In other words, we can develop standards of rationality that do not violate the ought-can principle by starting with idealized standards, and then accounting for the practical constraints to which we are subject.

If we do remove the normative element from epistemology's idealized standards of rationality, then of course they will no longer violate the ought-can principle. However, it is mistaken to think that we can arrive at normative standards of rationality that do not violate the principle by starting with those that do, and then imposing practical considerations. Effective cognitive strategies are generally designed to be effective within specific circumstances that have their own unique set of constraints. Since idealized standards of rationality are formulated on the basis of how an ideal rational agent would behave in a constraint-free environment, they are designed to apply to cognitive systems that operate in such an environment. An ideally rational cognitive system will not simply work non-ideally when placed into a constraint-laden environment. Rather, it will generally cease to work at all (Cummins et al. 2004). Since an ideally rational system will cease to work in a non-idealized environment, we cannot look at how it would behave in such an environment to arrive at non-idealized standards of rationality.

On a similar note, when we try to determine an ideally rational strategy for approaching a problem or goal by abstracting away from real world constraints, we don't approximate how an ideally rational agent would approach the problem. Rather, we change the problem. So even if we could get some handle on how an ideally rational agent would approach *some* problem, this problem will not be one we will encounter in our constraint-laden circumstances.

For example, consider the problem of predator detection. The point of a predator detection system is to allow an organism to avoid predators, and so the ability to detect predators *quickly* is an essential feature of such a system. To be effective, a natural predator detection system will tolerate a high degree of false positives. The cost of a false positive is far lower than the cost of taking more time in order to maximize accuracy. If we were to follow the standard ideal rational agent standard in epistemology, we might think that an ideal predator detection system is one that is maximally accurate. Following the suggestion entertained above, this would suggest that, though we are not ideally rational, we should aim for the goal of maximum accuracy when concerned with detecting predators. But taking this as the goal ignores the very goal that predator detection systems are designed to achieve, namely, predator avoidance. If a maximally accurate predator detection system is subject to real world time constraints, any organism that uses such a system will not survive to reproduce (Cummins et al. 2004, 296–297). The “ideal”, i.e. maximally accurate, predator detection system and the natural one are aimed at solving different problems. The former is solving the problem of accurately detecting predators while the latter is aimed at detecting predators *within a limited time frame, that is, in time to escape*. If we abstract away from temporal considerations, we change the very problem being solved. If we are interested in solving problem X, then we should model effective strategies for solving X, not effective strategies for solving a structurally distinct problem, Y. This is why the baseball analogy is a bad one: both the ideal hitter and actual hitters *are* aiming at the same problem, namely, safely reaching base.

We have then, two reasons for thinking that individuals cannot be the appropriate subjects for epistemology's normative standards of rationality. First, these standards of rationality govern pure theorizing, which we can never be wholly engaged in due to the constraints to which we are subject, even if these are simple deadlines. Second, these standards cannot be simply modified to account for practical concerns because any attempt to so modify them changes the nature of the problem under consideration from a problem that is realized in an ideal abstract environment, to a problem that is interwoven with all the other problems and goals with which we have to be concerned. In this next section, I consider the institution of science as a candidate for epistemology's normative standards of rationality.

3.5 EPISTEMOLOGY'S RATIONALITY APPLIED TO SCIENCE

In the previous section I argued that epistemology's normative standards of rationality cannot be applied to individuals without violating the ought-can principle. These standards appear to require that rationality requires engaging in a sort of pure, truth-aimed theorizing that must be conducted independently of concerns that result from resource constraints and practical considerations to which we are constantly subject. Since we are incapable of theorizing in such a manner, these standards violate the ought-can principle.

However, we often make efforts to circumvent these constraints in various ways, particularly in theoretical pursuits. One way in which we do this is by institutionalizing research programs. This allows us to bolster our capacities for computation and memory, as does the development of various instruments and media for the storage and processing

of information. Although institutions are still subject to some constraints, perhaps they come close enough to reaching the idealized conditions in which epistemology's standards of rationality are developed, such that they can be held accountable to these standards without violations of the ought-can principle.

For present purposes, I will grant the assumption that through institutionalization, science comes close enough to reaching these idealized conditions. This eliminates concerns that the ought-can principle is violated for the institution of science. However, one might be concerned from the onset by my conceiving of the institution of science as a cognitive system.

This raises the question of how we should think of the concept of a cognitive system. While it would be beyond the scope of this project to give a full analysis of the concept, Cummins et al. (2004, 289–290) provide several features that provide a general characterization of such systems, some of which are listed below:

- Cognitive systems are information driven, and some of this information is represented.
- Cognitive systems are complex, with interactions among sub-systems and components also being information driven.
- Cognitive systems are goal directed, and hence subject to normative assessment. In this sense, these systems can be rational or irrational.

If one accepts that these features provide a general characterization of cognitive systems, then this opens up space for a notion of collective cognition, i.e., the idea that cognition is not limited to individual organisms. For instance, consider crowdsourcing, often called “artificial artificial intelligence” which has been defined as:

A type of participative online activity in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd

should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilize to their advantage that what the user has brought to the venture, whose form will depend on the type of activity undertaken (Estellés-Arolas and González-Ladrón-de-Guevara 2012, 9–10).

While the institution of science is clearly not an instance of crowdsourcing, the two share several of the features of cognitive systems listed above, such as being information driven, goal directed, complex, and having sub-systems. So if one is willing to accept that crowdsourcing constitutes an instance of collective cognition and is a sort of cognitive system, one should be prepared to accept the same for the institution of science.

Since I have granted the assumption that applying epistemology's normative standards of rationality to the institution of science does not violate the ought-can principle, in this section the focus will be on the other respect in which these standards of rationality are limited, namely, they are equipped to evaluate only cognitive systems that operate exclusively in terms of propositional representations and are aimed at believing, or otherwise acquiring, true propositions. However, science engages in widespread use of non-propositional representations, and for this reason, epistemology's norms of rationality are incapable of assessing science for rationality. Moreover, science is not always aimed at truth, and is instead interested in developing *accurate* representations of its targets. It follows from the representational pluralism thesis, introduced in section IV, that these are different types of targets.

Since epistemology's normative standards of rationality evaluate a system's performance in regards to how well it gets at the truth, these standards will not be applicable to any system that aims at something else. Moreover, these standards take

reasoning and rationality to consist in inferential relations among propositions. So even in cases where the aim is truth, if non-propositional representations are involved in the reasoning process that leads to the truth, epistemology's standards of rationality will be ill equipped to evaluate such reasoning.

Giere (1999) provides evidence that the traditional view of science in philosophy of science is not an accurate understanding of how science works. As we will see below, he argues that scientists use visual models in deciding among competing theories, which requires that we make room for non-propositional representations in our understanding of scientific practices, theories, and knowledge. As a case study, Giere draws on the use of visual representations in the debate in 20th century over *stabilism* and *mobilism* in geology. According to stabilism, the Earth's major geological features were formed in roughly their current figuration, whereas under mobilism, the relative positions of these features have changed since their original formation. Mobilism was finally accepted because certain visual representations made it clear that certain geological data was highly improbable on a stabilist account. In other words, these visual representations played a central role in making a "crucial decision" between two competing scientific theories.

In other cases, scientists are interested in, not only using, but in constructing, representations that are visual, and thereby cannot be evaluated for truth, but instead for accuracy. An advocate of the normative standards of epistemology might think that in these cases, we can simply substitute talk of "accuracy" for talk of "truth" and otherwise preserve the standard epistemological construal of rationality. However, accuracy has certain characteristics that truth does not, eliminating the prospects for such a

substitution. Moreover, as discussed in section IV, the evidential role played by such representations rests on the structural relationship between the representations and their targets. This sort of relationship cannot be captured by the linguistic report by these representations are sufficiently accurate.

For a further example, consider Brown's discussion of two visual representations of the methane molecule, a ball and stick model, and a space filling model (2003, 23, figure 2.4). While both representations are consistent with experimental data, they each accurately portray certain features of the methane molecule while failing to accurately capture other features. For instance, in the ball and stick model the use of rods, or "sticks", allows the representation to accurately capture the bond distance between the carbon atoms and each hydrogen atom. The space filling model provides information about the relative sizes of the atoms, but at the expense of representing information about the bonds between these atoms (Brown 2003, 24). When we are concerned with non-propositional representations that must be assessed for accuracy rather than truth, we have to keep in mind that accuracy along one dimension often comes at the expense of inaccuracy along others.

The general lessons to be drawn from the discussion of Giere and Brown is that, even if we assume science has sufficient resources to overcome the constraints to which individuals are subject, epistemology's normative standards of rationality are still not capable of evaluating scientific reasoning due to the role of non-propositional representations in this reasoning.

If we understand knowledge as something that is achieved through the satisfaction of standards of rationality, and epistemology's standards of rationality are incapable of

evaluating scientific reasoning, then it seems knowledge as understood in science is distinct from how it is understood in epistemology, and good epistemological performance in science must be evaluated by standards of rationality that are distinct from those that are traditionally used in epistemology. In short, the institution of science does not appear to be a suitable candidate for epistemology's normative standards of rationality.

3.6 RATIONALITY AND KNOWLEDGE

Thus far, my attack on the current state of epistemology has focused on the field's commitment to truth-directed, rather than practical, normative standards of rationality. Since epistemology is generally understood to be the theory of knowledge, rather than the theory of rationality, it needs to be clear to what degree the concerns I have raised call for revision within the field. As I have discussed, the normative standards of rationality in epistemology amount to a theory of justification. So it may appear that the concerns I have raised apply only to epistemological work on the concept of justification, rather than the concept of knowledge. In this section I discuss the relation between rationality, justification, and knowledge.

If the account of justification in epistemology violates the ought-can principle, that is, if being justified requires cognitive systems to satisfy epistemic constraints that they cannot satisfy, then knowledge will be unattainable for cognitive systems like us. In other words, because the general consensus is that justification is necessary for knowledge, if we cannot be justified in the way that epistemology's norms of rationality demand, knowledge will be out of reach.

This skeptical consequence appears to follow from epistemology's use of normative standards of truth-directed rationality. These standards constitute epistemic constraints that must be satisfied for a belief to be justified, and so these constraints must be satisfied to acquire knowledge. But if these constraints violate the ought-can principle, then they clearly cannot be satisfied. Fortunately, the ought-can principle provides a way in which we can avoid this skeptical result. Rather than accept that knowledge is unattainable because we cannot satisfy the relevant epistemic constraints, we can take the fact that we cannot satisfy these constraints as a reason for rejecting the claim that these are the constraints we must satisfy in order to have knowledge.

Recall the analysis problem, i.e., the epistemological research program of developing an analysis of knowledge that avoids skepticism and Gettier-style counterexamples. In order to see how the issues of rationality, justification, and knowledge are intertwined, we need to determine what epistemologists are targeting when working on the analysis problem.

3.7 METAPHILOSOPHY AND METHODOLOGY

Whether one thinks philosophical theories of knowledge should be sensitive to psychological or scientific accounts of knowledge may depend on what one takes the target of the analysis problem to be. In other words, when philosophers engage in developing analyses of knowledge, what do they take themselves to be analyzing? Whether or not it is explicitly acknowledged, the analysis problem applies exclusively to accounts of propositional knowledge.

Even if we can establish that those engaged in the analysis problem are attempting to develop analyses of propositional knowledge, it is still not clear what the target of this analysis is, or should be. One might think that a correct analysis of knowledge should be one that is a necessary truth, that is, an analysis that picks out all and only cases of propositional knowledge in all possible worlds (see Ichikawa and Steup 2012).

But if an epistemologist's aim is to provide an analysis of propositional knowledge that is extensionally correct in all possible worlds, it is unclear what constrains such a project, that is, what determines whether a proposed analysis is correct. The standard methodology employed by philosophers that are engaged in projects of this sort is some form of reflective equilibrium. The method of reflective equilibrium amounts to working back and forth between a theory of a concept (e.g. justice or knowledge) and intuitions or considered judgments regarding particular cases. When the theory and an intuition do not line up, we either revise the theory to accommodate the intuition, or reject or explain away the intuition. When we have conflicting intuitions, one or both of them must be given up. Eventually, the goal is to have our theory and intuitions line up in a "reflective equilibrium," (Daniels 1979; Goodman 1955; Rawls 1999).

If the method of reflective equilibrium is supposed to enable us to develop conceptual analyses that are necessary truths, then the method must be assumed to provide us with modally robust epistemological powers, that is, the ability to glimpse into other possible worlds and gather data that is relevant to the concept we are engaged in analyzing. This is why hypothetical thought experiments are taken to be useful for philosophical analysis. Since these thought experiments are hypothetical, they describe cases that are not realized in our world, but conditions in other possible worlds.

If intuitions that are generated through the method of reflective equilibrium are supposed to provide the constraints on developing an analysis of knowledge that is a necessary truth, then we must assume that they have evidential force. If they were not taken to have this force, then there would be no reason why we should revise our theories to accommodate these intuitions, or go to the trouble of explaining them away.

Cummins (1999) has suggested that the method of reflective equilibrium is simply a kind of standard scientific method given a new name. In science a theory is constructed to account for observations, and observations that are incompatible with a theory must be explained away. When they cannot be explained a way, the theory must be revised to account for the data. In philosophical reflective equilibrium, intuitions or considered judgments are taken to play the role of observational data in science.

However, as Cummins subsequently argues, the reason that observational data is taken seriously in science is because it is intersubjective. Scientific observations can be, and are, calibrated, that is they can be checked by an independent standard. Intuitions or considered judgments, by contrast, are not intersubjective. Different individuals have different intuitions about the same cases. In science, when we have conflicting observations, we have to explain away one or both of them. When this cannot be done, the observations have to be set to the side, and neither can be taken as evidence for or against a theory.

In order to calibrate intuitions, we need to have another means of access to the target of these intuitions. In some cases, it may be possible to calibrate our intuitions. But if there are such cases, then intuitions become evidentially useless. If we have a theory that is sufficiently established to serve as a check on our intuitions, then we have no use

for the intuitions as a way to establish, or provide evidence for the theory in question. On the other hand, when we lack a standard by which we can calibrate intuitions, we have no reason to think these intuitions are evidential (Cummins 1999).

Even if we set aside the calibration problem, there does not appear to be any plausible account of how intuitions can be the result of a modal reality. In other words, there is no plausible explanation as to how intuitions could be reliable indicators of states of affairs in other possible worlds. On the other hand, there are plausible psychological accounts of how intuitions are formed, and these accounts provide strong reasons for doubting their evidential significance (Cummins 1999).

One might, of course, be unconvinced by these arguments or hold that there are certain concepts that can only be studied through intuition, and a theory of such concepts should aim to settle into a reflective equilibrium. One might, for instance, think that so long as we are not skeptics about certain domains, such as ethics or mathematics, then we must accept that intuitions are epistemologically valuable in these domains because nothing else could ground knowledge in these domains (Cummins 1999).

While I don't find this argument to establish that intuitions are evidential in certain domains persuasive, here my concern is not with mathematics or morality, but rather with the theory of knowledge. Knowledge, perhaps unlike ethics and mathematics, is a domain that can be, and has been, studied scientifically. If one engages in reflective equilibrium in attempting to develop a theory of a concept that overlaps with science, then one will engage in epistemological poaching. We can, and do, have intuitions about concepts that overlap with science. For example, before taking a physics course, some people will have the intuition that when two balls of the same size, one hollow and one

solid, are dropped from 100 feet, the solid ball will hit the ground first. But of course, if we investigate this question empirically, we will find that the two balls will hit the ground at the same time.

Recall from chapter 2 that B&M's complete and correct conceptions requirement for know-how rests on our having certain semantic intuitions in response to thought experiments, such as their *Salchow* case. As I argued there, we have no reason for thinking ordinary language is designed to be as precise as their account of know-how requires because it did not evolve to accommodate cases like *Salchow*. Their account requires a revision of how language works. But when scientific terms, including psychological terms, are under consideration, revision needs to be motivated by science, not semantic intuitions.

Setting aside skeptics, epistemologists hold that we have knowledge. Unless one is a substance dualist, one will surely hold that this knowledge is represented or instantiated in a physical system. If this is right, then "knowledge" just like "know-how" is, at least, a partly psychological term, and if we are to make claims about how "knowledge" is to be used, these claims need to be motivated by science, not semantic intuitions.

An advocate of standard epistemology might respond by denying that any of these issues have implications for epistemology when we have a proper understanding of the field. Epistemology, the response goes, is concerned with providing an analysis of knowledge and this is independent of scientific questions about how cognition works, or how knowledge or information is mentally represented.

Philosophers operating under this perspective want to have their cake and eat it to. They want philosophical analysis to be unconstrained by science, but they also want science to be constrained or influenced by philosophy. The problem is that these constraints have to run both ways. You cannot quarantine philosophy from science without also quarantining science from philosophy. To insist that implications go only one way, from philosophy to science, is to endorse poaching. If philosophy really is roped off from any influence from science, then not only can science not have implications for philosophy; philosophy cannot have implications for science. It cannot, for instance, tell cognitive scientists or psychologists what concept they should be studying when they are interested in how knowledge is mentally represented. Under such a quarantine, philosophical and empirical studies of knowledge (and other issues) become entirely disconnected, and if this occurs, then philosophy will be reduced to a field concerned with solving self-generated puzzles, and generating the standards for properly solving these puzzles, resulting in a notion of incorrigibility similar to that of sense data. If one thinks that sense data are mind-dependent, that is, independent of objects outside of the mind, then we cannot be wrong about objects or properties of sense data. However, these mind-dependent objects are quarantined from anything else in the same way that one might try to quarantine philosophy from science. The benefit of such a quarantine, incorrigibility in the case of sense data or autonomous self-governance in the case of philosophy, comes at a cost of having no implications outside of the quarantine. If philosophy or sense data had implications outside of their isolated domains, then when the implications fail, we would have reason for making changes. But since the quarantined cannot have implications of this sort, they provide no evidential value.

Here, one might think that even if this is what philosophy is reduced to, this is not problematic for the field, because philosophy is concerned with, and can still make, progress within philosophy. Even if philosophy is quarantined from scientific data, and cannot have implications for science, philosophers within the quarantine serve as a check on one another, and so even if there is a broad sort of incorrigibility understood as philosophical autonomy or self-governance, there are still checks and balances within the field, which generates standards of correctness and opportunities for error and correction.

This form of self-governance should not be as comforting as it might initially sound. Under this quarantined set up, since philosophy cannot be held in check by scientific data, what seems to be left, at least in conceptual analysis projects, is some form of reflective equilibrium and a reliance on intuitions or considered judgments. Moreover, certain concepts that would appear to be scientific, such as knowledge or know-how, will be understood as non-scientific, and so poaching objections get pushed to the side. But even if we set aside poaching, there are still reasons to worry about taking intuitions as evidential within the quarantine. Moreover, it is difficult to determine the significance of any progress within the quarantine.

One of the worries regarding the use of intuitions as evidence has already been discussed above, namely, the worry that in order for intuitions to be evidential they must be calibrated, but once they are calibrated, they become evidentially useless. But even if one is unconvinced by this challenge, a further problem raised by Cummins (1999) pertains to the issue of which intuitions are taken to be evidential and which are to be dismissed. If reflective equilibrium is to be understood as analogous to scientific practice, where intuitions play the role of observational data, then it is important to properly treat

cases of conflicting intuitions. If we have a case of conflicting intuitions, then they cannot be taken as data until the conflict is resolved.

Unfortunately, this norm does not seem to be generally followed in philosophy. While philosophers make efforts to explain away intuitions that conflict with their own, they continue to claim support from these intuitions without first resolving the conflict. Cummins draws on the example of intuitions generated from Twin-Earth cases in the theory of content. Since Putnam's (1975) view on Twin-Earth cases is widely accepted within philosophy, one might think that it is reasonable to take his intuitions about the case to be evidential. However, most non-philosophers do not share the Putnamian intuition (Cummins 1999). But since these conflicting intuitions come from non-philosophers, they are not taken as a source of conflict, that is, a reason for resolving the dispute before proceeding forward. This amounts to a second form of quarantine. Not only does philosophy become quarantined methodologically, it becomes quarantined sociologically. The use of reflective equilibrium isolates philosophy methodologically because in order to avoid poaching, philosophy cannot have implications outside of philosophy. Restricting the relevant intuitions to philosophers isolates philosophy sociologically because even non-philosophers who might be understood as engaging in reflective equilibrium have their considered judgments set aside, at least when they are in conflict with the accepted intuitions within philosophy.

If we accept that intuitions are non-evidential and also wish to avoid operating under a perspective of philosophy where the field is quarantined from science, then we need to consider alternative methods and perspectives. As Cummins (1999) argues, there is hope for philosophy without intuitions. In the theory of mental representation, he

suggests that, instead of asking whether ‘water’ refers to H₂O on Earth and XYZ on Twin Earth, we can ask what explanatory role is played by representation. Similarly, philosophers of physics don’t consult their intuitions about what space or time are, but instead ask how we need to understand these concepts if the physical theories that invoke them are to be accurate and explanatory.

I suggest that we do the same in epistemology. Rather than asking what knowledge is from a quarantined position, we should ask what role knowledge plays as the concept is deployed in the various domains that employ it. It is quite possible that knowledge plays a different role in different domains or even within the same domain. For instance, the role of knowledge in ordinary language or common sense may be different from the role of knowledge in science. In the remainder of this chapter, I will discuss what role knowledge plays in these domains. If these roles turn out to be distinct, then this will suggest a need for a pluralistic approach to the theory of knowledge.

CHAPTER 4

THE ROLE OF KNOWLEDGE ACROSS EPISTEMOLOGICAL DOMAINS

4.1 COMMONSENSE AND ORDINARY LANGUAGE

In this chapter, I examine the role that knowledge plays in two domains: common sense or ordinary language and within the institution of science. In this section I begin with the former.

In everyday usage, or under common sense, knowledge is often invoked to provide a sense of warranty or assurance for action. If someone tells us that they know something, we feel a certain degree of confidence in acting as though what we are told is the case. Admittedly, thinking of knowledge in this way has drawn some attention in the epistemology literature. In this section I outline my proposal and explain how it is distinct from existing accounts.

In the first chapter I discussed Fantl and McGrath's pragmatic encroachment approach to epistemology, which provides some support to the idea that a common sense concept of knowledge plays a warranty-granting role. While Fantl and McGrath take their account to be one in which non-epistemic, practical considerations "encroach" upon epistemology, I criticized their account for appearing to posit epistemic encroachment upon the practical. Recall that they claim that if S knows that p, then S is rational to act as if p. My criticism of their position amounted to arguing that there are cases in which we know that p, but may still be rational to act as if it is not the case that p or which it would be irrational to act as if p. While I stand by this criticism, their discussion provides

motivation for the claim that knowledge plays a warranty-providing role in common sense.

Fantl and McGrath motivate their view by noting that we often defend or criticize actions by citing knowledge. The husband defends his action of driving straight home without stopping to get yams the night before Thanksgiving by citing his knowledge that there were already yams at home. The worrisome person criticizes her action of going back to check the doors by citing her knowledge that they were already locked. In the first example, knowledge is playing an assuring role, while in the second case an action is being criticized because the agent fails to heed the assurance or warranty that knowledge should provide.

But there seem to be many cases in which one can know that *p* and rationally act as if not-*p*. Consider a modified version of the predator detection case in which a woman is trying to decide which route to take on her walk home from work late at night. Ultimately her goal is to get home safely and as quickly as possible, so the shortest route may initially seem preferable. However, the shortest route goes through several empty dark alleys while the longer route goes along well-lit streets with lots of traffic. Now suppose that, through whatever means, the woman comes to have lots of good evidence that the shorter route is safe at the time, such that most philosophical accounts of knowledge would say she knows the route is safe. On Fantl and McGrath's view, this would appear to entail that it would be rational for her to take the short route through the dark alleys home. But if she were to do so, we could easily imagine a family member criticizing her decision by saying, ““Despite all of your evidence, there was no *guarantee* that the alleys were safe,” or “Despite all of your evidence, you didn't *know* that the

alleys were safe.” How should we evaluate the women’s epistemic state in this circumstance from the perspective of common sense? Was her belief that the alley was safe a case of knowledge?

The claim that there is a substantial connection between knowledge and action has received a fair amount of treatment among epistemologists in the last several years. Jason Stanley (2005) labels the thesis that knowledge does *not* depend on practical matters *intellectualism* (not to be confused with intellectualism about know-how). A common commitment among *anti-intellectuals*, i.e. those that believe that knowledge *does* depend on practical matters, is that “one should act only on what one knows,” (Stanley 2005, 9; also see: Fantl and McGrath 2002; Hawthorne 2004). Call this the *act-knowledge principle*. There appears to be an ambiguity in this principle that should be noted. On one reading, the principle can be understood to say that what we know determines how we ought to act. That is, if I know that p, then I should act as if p. On another reading, the principle can be understood as saying that how we ought to act determines what we know. That is, if I should act as if p, then I know that p. Despite this ambiguity, Hawthorne’s discussion of the principle suggests that he has the former in mind. He writes,

“One ought to only use that which one knows as a premise in one’s deliberations. There are complications that call for *ceteris paribus* style qualifications. In a situation where I have no clue what is going on, I may take certain things for granted in order to prevent paralysis, especially when I need to act quickly,” (Hawthorne 2004, 30).

While I am sympathetic to the spirit of anti-intellectualism in this context (and in others), Hawthorne and others appear to be placing the epistemological cart before the practical horse, despite the caveat regarding *ceteris paribus* qualifications. My concern with Hawthorne's discussion of the principle is that it suggests that *ceteris paribus* circumstances will be the rule rather than the exception. In other words, his discussion suggests that most of the time we need to acquire knowledge, as understood in mainstream epistemology, before being able to act rationally. But due to the very nature of practical goals and the constraints inherent in real life, things will hardly ever be equal, and there will almost always be things that we have to take for granted in order to act in a timely manner. So even if it might in some sense be true that we should use only what we know, in the standard philosophical sense, as a premise in our practical deliberations when all other things are held equal, it will almost never be the case that this qualification applies.

If knowledge depends on practical matters, as I believe it does in every day contexts, then questions of how we ought to act should come before questions of what we know. If we ought to act only on what we know, i.e., if we ought to only use what we know as premises in deliberations about what to do, then knowledge does not depend on practical affairs, as anti-intellectualists seem to want, but rather, answers to questions regarding practical affairs appear to depend on knowledge. This amounts to imposing norms of truth-directed or epistemological rationality on the practical domain, not imposing norms of practical reasoning on the epistemological.

Despite the problems with their view, Fantl and McGrath capture an important insight in noting that we appeal to knowledge to defend or criticize action. The problem with their position comes by way of the manner in which they apply this insight. If knowledge is indeed used to defend or criticize action, then in this domain knowledge is playing a warranty-granting role, i.e., it provides an assurance that the action being defended was the right one, or the action being criticized was the wrong one. Actions, however, are subject to evaluation according to normative standards of *practical* rationality. So if knowledge is being used to justify an action as rational, then it should be evaluated in terms of its practical, rather than truth-directed, effectiveness.

If knowledge does indeed play this sort of role in everyday contexts, then knowledge under common sense will differ substantially from knowledge as understood in traditional epistemology. In traditional epistemology, knowledge is a type of true belief that has special features, viz., justification and perhaps some sort of anti-Gettier condition. But that which serves as a provider of warranty or assurance in practical reasoning need not have these special features. In fact, it may not even need to be a true belief.

Let's return to the modified predator detection scenario. From the standpoint of standard epistemology, it may seem that the woman knows the shorter route is safe, and so she ought to take this route since her goal is to get home both safely and as quickly as she can. But the costs of being wrong about the safety of the short route in this case are extremely high. She could be robbed, kidnapped, or worse. Here, rather than acting on what she, according to standard epistemology, knows, the rational strategy would seem to be adhering to a rule of thumb that says dark alleys are to be avoided. In this case, this

rule of thumb would seem to, at least in part, justify the action of taking the longer route. In contrast, the woman's belief that *this* alley is safe *at this time* does not seem to be adequate to make the action of taking the shortest route rational.

Now it might appear that, in this example, the evidence that the woman has for the alley's being safe and the belief formed on the basis of this evidence should provide a sort of warranty or assurance that taking the short route is safe and thereby the rational action given her goals. So this might appear to be a case in which the warranty based account of knowledge and the way in which I am trying to connect knowledge to practical reasoning come apart.

The reason for this apparent divergence is that the degree of warranty or assurance needed to rationally form a belief is often far less than that which is needed to rationally undergo a course of action. Forming a belief is generally low risk, whereas taking an action often is not. If the woman in our example forms the belief that taking the short route would be a safe thing to do, then if it turns out she is wrong there is no substantial cost to be paid. The cost of being wrong comes into play only if she acts on this belief.

Intellectualists, i.e. those who hold that knowledge is not dependent on practical considerations, will hold that, in the case under discussion, the woman does know that the alley way is safe because the costs of acting on a false belief do not factor into their understanding of what is required for knowledge. Furthermore, they will deny that knowledge needs to be the sort of thing that provides warranty or assurance for action. Anti-intellectuals, on the other hand, hold that knowledge is connected to practical considerations, but they go wrong in formulating the details of this connection. For

proponents of this view, the connection between knowledge and action consists in the claim that we should act only on what we know, or that it is rational to act on what we know. But even on this position, knowledge appears to be understood in the way that is standard in epistemology. That is, anti-intellectuals will take it that, because of her evidence, the woman knows the alley is safe, and so it is rational for her to proceed home on this route, which amounts to imposing truth-directed norms of rationality on practical affairs.

Rather than taking the alleyway example to be one in which the warranty-providing and pragmatic accounts of knowledge come apart, the case is in fact one in which common sense and philosophical understandings of knowledge come apart. In this case, the woman's evidence may provide enough warranty or assurance for forming the belief, and coming to know, in a standard philosophical sense that is divorced from practical considerations, that the alleyway is safe. But this same degree of warranty is not sufficient for her to rationally go home by way of this route. So if knowledge is used to establish the practical rationality of an action in common sense by providing warranty, the woman does not have common sense knowledge.

Given the criticisms I have leveled against traditional accounts of normative standards of rationality in epistemology, it might seem odd that here I seem to be suggesting that the demands of common sense knowledge are more stringent than those of philosophical knowledge. A good deal of my criticism of standard epistemology amounted to arguing that epistemology's standards of rationality are too demanding in that they violate the ought-can principle. But here, I've suggested that in the modified predator detection example, the woman may have enough warrant to meet the standards

for philosophical knowledge that the alley is safe, but not enough to meet the standards that must be met in order for her to rationally act on this belief.

The appearance of inconsistency stems from two different perspectives from which this evaluation is being conducted. In the truth-directed domain, the goal of a rational agent is forming true beliefs, and the standard procedure is to abstract away from constraints of time and memory. In abstracting away from these constraints, the problem becomes not one of finding an effective strategy for serving a practical goal, but rather simply forming a belief that is true. The consequences of being wrong when the goal is purely truth-directed are very low, or non-existent, at least until the theory is put into practice. When we are engaged in pure theorizing, we can take as much time and gather as many resources as we need in order to ensure that we are in the ideal epistemic position, making getting things wrong highly unlikely. If we do get things wrong in such circumstances, this can generally be explained in terms of a failure to account for an important piece of evidence, or a failure to reason correctly.

From the practical perspective, various constraints and the consequences of being wrong are central to the problem at hand. This is why, as discussed above, abstracting away from constraints and practical applications changes the very nature of the problem under consideration. Due to the way in which abstraction alters the problem under consideration, there is a sense in which normative standards of truth-directed rationality are more demanding, but a different sense in which the normative standards of practical rationality are more demanding.

The standards are more demanding in the truth-directed case because they violate the ought-can principle. They require us to overcome resource constraints that we cannot

possibly overcome. Here time is particularly relevant to the issue of consequences of being wrong. When we have unlimited time, as we do in abstract idealized circumstances, we can become as certain as we can of anything that, for instance, the alleyway is safe and that traveling home on this route is the correct course of action. But in this case, the problem is not evaluating what action it is most rational to take, rather it is deciding which belief it is most rational to adopt, that is, the belief that the short route is or is not safe. So even if it seems that the woman does come to know that the alley is safe in the example, which is clearly not an idealized circumstance, evaluating whether her belief was rationally formed is distinct from evaluating whether her action is rational because the practical consequences of being incorrect factor into the latter, but not the former evaluation.

The standards are more demanding in the practical case because the consequences of being wrong are crucial to determining the correct or rational course of action. In many cases, this will mean that the rational course of action is not what would be most optimal from a God's eye perspective, but rather taking the action that errs on the side of caution. Even when one has enough evidence to rationally form the belief that, for example, the shortest route home is safe, the rational action is to err on the side of caution and take the longer route.

So far I have suggested that knowledge in common sense contexts is that which serves the role of making action, rather than belief, rational by way of providing warranty or assurance. If this is correct, then epistemology's job is to determine what knowledge is if it indeed it is to be suited to play such a role. In traditional epistemology, knowledge can be roughly characterized as a true proposition that one believes on the basis of

evidence (i.e. a justified true belief). While propositions of this sort may at times be sufficient to provide warrant for action, such a characterization is inadequate to cover all cases. Since effectiveness is more important than truth-conduciveness in the practical domain, that which plays the role of knowledge in commonsense will, at least in some cases, deviate from how knowledge is understood traditionally in philosophy.

While this perspective has been generally ignored or overlooked in philosophy, it has received some attention in cognitive science. Gigerenzer and Goldstein (1996) lay out three perspectives on the question of how organisms make inferences in cases of uncertainty or incomplete information. The first perspective is the *classical view*, which holds that the laws of human inference are laws of probability and statistics. Those who are inspired by the classical view take statistical methods to be both the normative and descriptive models of inference and decision-making. The second perspective is the *heuristics and biases program*, which holds that the classical view is correct normatively, but not descriptively. In other words, human inference is error prone and systematically biased. Rather than using the rules of probability and statistics, we use quick and dirty heuristics. Still, adherents to the heuristics and biases program believe that the laws of probability and statistics are normative, and errors in reasoning are defined in terms of failures to adhere to these laws. The third perspective, which is endorsed by Gigerenzer and Goldstein, holds that the laws of probability and statistics neither describe human inference, nor provide the normative standards that govern it.

Experimental tests of the classical view and the heuristics and biases program have generally been conducted in unrealistically simple situations, such as Bayesian inference with binary hypotheses where all the relevant information is provided for

participants (Gigerenzer and Hoffrage 1995). However, in the real world Bayes's theorem and other algorithms that are taken to be rational on the classical view are complex and intractable for the human mind. If the classical view is correct, then this would entail that the mind is akin to a Laplacian Demon. If the heuristics and biases view is correct, then this would entail that humans are "hopelessly lost in the fact of real-world complexity, given their supposed inability to reason according to the canon of classical rationality, even in simple laboratory experiments," (Gigerenzer and Goldstein 1996, 650–651).

Gigerenzer and Goldstein's perspective on human inference is inspired by Herbert Simon's work on *bounded rationality*. Simon's (1956; 1982) view is that cognitive systems need to *satisfice* rather than *optimize*, where satisficing amounts to using an algorithm that successfully accommodates conditions of limited resources and information. If we consider, for example, the problem of mate selection, a satisficing procedure would be to choose the first mate that meets an organism's level of aspiration rather than engaging in the intractable task of calculating the expected utility of choosing each possible mate and then going with the choice that scores the highest (Gigerenzer and Goldstein 1996, 651).

As may be obvious, the perspective of rationality embedded in philosophy closely resembles the classical view. The research that motivates the heuristics and biases program demonstrates that the descriptive component of the classical view is incorrect, that is, humans fail to make inferences in accord with the rules of probability and statistics. But if we take this research to show that human inference is *systematically* biased and "error" prone, this should be taken, not to show that humans are

systematically irrational, but rather that we are wrong in taking the laws of statistics and probability to be normative due to the ought-can principle.

One worry regarding this use of the ought-can principle is that because we have discovered that humans have developed the laws of statistics and probability, there is an obvious sense in which we *can* reason in accordance with them. Perhaps most people do not do so, and perhaps a good number of people *cannot* do so, but this does not show that a normative view of statistics and probability violates the ought-can principle. It only shows that some people are rational in virtue of meeting these normative standards, while others are not.

There are at least two ways to respond to this objection. First, as mentioned above, the experiments that have been used to show that people systematically fail to adhere to the rules of statistics and probability use simple situations in which all the relevant information is provided to the subjects. In the real world things are far more complex, and so applying these rules becomes intractable for human minds. Since applying these rules is intractable in real world situations, taking these rules to be normative does appear to violate the ought-can principle. This amounts to what Gigerenzer and Goldstein call the *cognitive* side of Simon's notion of bounded rationality. Human minds are cognitively limited, unlike the Laplacean Demons of the classical view of rationality (Simon 1945). However, Simon's bounded rationality also has an *ecological* side, which emphasizes that minds are adapted to real-world environments. On Simon's view, these two sides go hand in hand. He writes, "Human rational behavior is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor," (Simon 1990, 7). In short,

Simon's bounded rationality, combining ecological and cognitive issues, shows that cognitive systems should be understood in terms of the environments in which they have evolved, not in terms of the normative standards of classical, i.e. truth-directed, rationality (Gigerenzer and Goldstein 1996, 651).

Gigerenzer and Goldstein show that simple, cognitively and ecologically realistic algorithms, are often more effective than the tools of classical rationality, that is, statistics and probability. As a demonstration, they use algorithms that implement principles of *probabilistic mental models* (PMM), which assume that we make inferences about the unknown based on probability cues. A probability cue is a feature from which we can make a probabilistic inference that an object falls within a certain category. A PMM uses limited information, such as probability cues, to make fast inductive inferences. To decide which of two objects is larger, a PMM uses information about a reference class of which the two objects are members. If, for instance, one is trying to decide which of two cities has a larger population, a potential cue is whether the cities have major league sports teams. Since major league sports teams tend to be located in cities with larger populations, if one city has a team and the other does not, the city that has the team is more likely to have the larger population (Gigerenzer and Goldstein 1996, 652). While using this cue will lead to some errors (e.g. when comparing Louisville, KY to Green Bay, WI), it will generally lead to the correct answer.

Gigerenzer and Goldstein model limited information in various ways, using the example of trying to decide the relative size of populations of German cities. One might have incomplete information regarding the objects in the reference class (e.g. she might only recognize some of the cities), limited knowledge of the cue values (e.g. whether or

not a given city has a soccer team), or in both of these respects. To approach this task, Gigerenzer and Goldstein use a *Take The Best* algorithm⁴¹, which consists of five steps (1996, 653):

- Step 1: the *recognition principle*: If only one of the two objects is recognized, choose the recognized object. If neither is recognized, choose randomly between them.
- If both are recognized proceed to step 2.
- Step 2: *search for cue values*: For the two objects, retrieve the cue values of the highest ranking cue from memory.
- Step 3: *discrimination rule*: Decide whether the cue value discriminates: A cue discriminates between objects when one of the objects has a positive cue value (e.g. has a major league sports team) and the other does not.
- Step 4: *cue-substitution principle*: If the cue discriminates, stop searching for cue values. If the cue fails to discriminate, return to Step 2 and continue until a cue that discriminates is found.
- Step 5: *maximizing rule for choice*: Choose the object with the positive cue value. If no cue discriminates, choose randomly.

The Take The Best algorithm exhibits several noteworthy features. First, search extends only through part of the information in memory and stops as soon as a discriminating cue is found. Second, the algorithm does not integrate information, but instead uses cue substitution. Finally, the amount of information that is processed is dependent on each task (which pairs of objects are being considered) and varies depending on the

⁴¹ While this is a general algorithm, Gigerenzer and Goldstein illustrate how it works by way of the city population size example.

information possessed by various individuals. For these reasons, the algorithm models bounded, rather than classical or truth-directed, rationality and demonstrates the notion of satisficing. That is, it stops after coming across the first discriminating cue, just as an organism may stop after finding the first potential mate that meets its level of aspiration (Gigerenzer and Goldstein 1996, 653–654).

Gigerenzer and Goldstein go on to provide empirical evidence that the Take The Best algorithm performs as many correct inferences as other “competitor” algorithms that adhere to standards of classical truth-directed rationality. In fact, Take The Best outperformed some of these competitor algorithms. Since Take The Best was also faster than any of the other algorithms, it is taken by Gigerenzer and Goldstein to exhibit the best overall performance (1996, 658). It is reasonable to take quickness of performance into account because “In many situations, time is limited, and acting fast can be as important as being correct,”⁴² (Gigerenzer and Goldstein 1996, 660).

The discussion of Gigerenzer and Goldstein’s findings puts us in a good position to offer a characterization of what knowledge needs to be to play the role that it appears to play under commonsense. Before offering this characterization, let’s review some of the relevant considerations. First, we are operating on the assumption that in commonsense, knowledge plays a warranty-granting role for action. In other words, knowledge in this context is what makes an action justified or rational. Since action falls into the domain of practical, rather than truth-directed rationality, action-based performance is to be evaluated according to normative standards of practical rationality. Gigerenzer and Goldstein’s Take The Best algorithm illustrates the type of procedure that

⁴² It is worth noting test taking is often such a situation as tests are frequently administered under time limits and test takers are penalized for questions they fail to answer. This context should be kept in mind by critics of ecologically realistic accounts of reasoning.

could serve to justify action from a practical perspective because the algorithm is effective in contexts of limited time and information.

Now here things become a bit tricky. If knowledge is that which makes action rational, and using the sort of algorithm of which Take The Best is an example is the sort of thing that makes an action rational, then we seem to be faced with the possibility that, under a commonsense perspective, algorithms rather than propositions are the sorts of things that constitute knowledge. This would constitute quite the radical departure from the way in which knowledge is generally understood within philosophy, and perhaps other disciplines as well. While I do not think radical departure from the status quo is in itself a strike against a proposal, it is the sort of thing that warrants some discussion and explanation.

If we take, for instance, Fantl and McGrath's examples to be representative of how knowledge is employed in commonsense contexts, then this would indicate that, in these contexts, knowledge is constituted by propositions that are then used to support actions (*I know that we have yams at home*, so I'll drive straight home). While this may seem like a fairly straight forward way in which to articulate that which plays a warranty-providing role for action, it does not strike me as completely adequate for a couple of reasons.

First, this seems to violate the very methodology I attempted to motivate earlier as an alternative to reflective equilibrium, that is, the methodology of seeing what knowledge needs to be if it is to play the role it plays in various domains. Fantl and McGrath's examples, and other that are similar, appear to presuppose some account of knowledge, and then argue that knowledge plays the role of justifying action. In other

words, the idea seems to be that we settle on the question of what knowledge is through another method, and then afterwards come to realize that it is applied to certain practical goals or problems.

Second, it does not seem that knowing a relevant proposition, or set of propositions, is sufficient for making an action rational. In addition, one needs a procedure for applying the proposition(s) to the case at hand. Analogously, knowing the premises of a deductively valid argument is not enough infer the argument's conclusion. While the premises certainly play a role, one also needs to know the rules of inference that allow one to infer the conclusion from the premises. These inference rules can be thought of as procedures for deducing the conclusion from the premises. So standard propositional knowledge does not alone seem to be sufficient for making an action rational. One also needs to have an understanding of how to apply this knowledge to the problem under consideration.

These two points suggest that some form of decision procedure, or algorithm, is needed in order for an action to be rational. Having propositional information that can serve as an input to an algorithm alone does not provide sufficient warrant or assurance that a certain course of action is rational. To have a sufficient degree of warranty, one also needs an effective procedure for processing or utilizing that information. To put it in somewhat more standard terms, it would seem that *knowing how* to put the information at one's disposal to practical use is essential for making a course of action practically rational.

In this section, I have offered a rough characterization of what knowledge needs to be if it is to play the role to which it is put in commonsense or everyday contexts. I

have argued that in these contexts, knowledge is that which serves as a source of warranty or assurance for action; it is what makes an action rational. While this characterization is admittedly rough, I believe it serves as preliminary work for a fairly substantial epistemological research project.

The most concrete part of my proposal has been to suggest that that which makes action rational, and thereby the sort of thing that fits the role of knowledge as used in commonsense, is the use of an effective decision procedure or algorithm of the sort discussed by Gigerenzer and Goldstein. This may seem unsatisfactory, given that it seems that knowledge is often used or discussed in everyday contexts in a way that is much closer to the way knowledge is understood in standard epistemology. It does not seem out of place with commonsense to say I know that Jefferson City is the capital of Missouri, or that I know that Barack Obama is the president of the United States in 2013.

I take this to suggest that we need to understand knowledge in pluralistic way. While I do think knowledge is often used in everyday contexts to justify or criticize action, it is unlikely that this captures all uses. Ultimately, the issue of what role knowledge plays in commonsense is an empirical question, and so it would be most desirable to accumulate a set of linguistic data to give us a clearer sense of the different roles the concept plays in ordinary usage.

4.2 SCIENCE

The aim of science is to provide us with an understanding of the world. In other words, science aims to explain natural phenomena. It would seem, then, that the role that knowledge plays in science is an explanatory role. However, it may be possible to have

an explanation for a phenomenon that is not correct or accurate. Such an explanation demonstrates, not how *actually* a phenomenon occurs, but rather how *possibly* or how *plausibly* the phenomenon occurs. Since science aims to provide theories that are not only explanatory, but correct or accurate, the role of knowledge in science is that of an accurate explanatory role.

In traditional philosophy of science, scientific explanations, i.e. scientific knowledge, is understood as that which is expressed by scientific laws. Under Hempel's famous Deductive-Nomological (DN) Model of scientific explanation, a scientific explanation has two main components: an *explanandum*, which is a sentence that describes the phenomena being explained, and an *explanans*, which is a set of sentences that account for the explanandum, at least one of which expresses a "law of nature" (Hempel and Oppenheim 1948).

While Hempel's (DN) model has been rejected for various reasons, many subsequent accounts of scientific explanation appear to assume that explanations are sentence-like in structure (Friedman 1974; Kitcher 1989; Salmon 1971). However, more recently, philosophers of science have taken a mechanistic model approach to explanation, and have moved beyond the linguistic framework established by Hempel. According to Salmon's Causal Mechanical model, an event is explained by tracing the causal processes that lead to it. This sort of explanation *shows* how the event in question "fit[s] into a causal nexus," (Salmon 1984, 9). Machamer, Darden, and Craver (2000) offer a mechanistic account of explanation, stating that we use mechanisms to explain how phenomena arise or how processes work. They define mechanisms as "entities and activities organized such that they are productive of regular changes from start or set-up

to finish or termination conditions.” However, some of their language suggests that an explanation consists, not in a mechanism, but in a description thereof. They write,

“*Descriptions* of mechanisms show how the termination conditions are produced by the set-up conditions and intermediate stages. To give a *description* of a mechanism for a phenomenon is to explain that phenomenon, i.e., to explain how it was produced,” (Machamer, Darden, and Craver 2000, 3, emphasis added).

But while Machamer et al state that descriptions of mechanisms for phenomena explain those phenomena, they made be read charitably as using “description” in broad sense to refer to representations of mechanisms, some of which may be non-linguistic. For instance, their paper includes many diagrams that are described as representing entities, properties, and activities that constitute mechanisms. These diagrams, unlike linguistic descriptions, represent spatial and structural features of mechanisms. In fact, Machamer et al note that “diagrams represent features of mechanisms that could be described verbally but are more easily apprehended in visual form,” (2000, 8).

Machamer et al hold that we should think about mechanisms as entities and activities in part for epistemic reasons, as both of these elements are important for offering mechanistic explanations. In order to understand the epistemic role played by activities and entities, we need to further clarify what mechanisms amount to. Activities are that which produces a change, and entities are that which engages in activities. Moreover, Machamer et al hold that mechanisms exist in nested hierarchies. The levels of these hierarchies are part-whole hierarchies, and lower level entities and activities are components in mechanisms that produce higher level phenomena (Machamer, Darden,

and Craver 2000, 13; Craver 1998; Craver and Darden 2001). Moreover, nested hierarchies of mechanisms generally bottom out in low-level mechanism, which are the components that are accepted as being unproblematic or accepted as fundamental. Bottoming out is interest-relative, and a mechanistic explanation ends when describing lower-level mechanisms would not be relevant to the problem at hand (Machamer, Darden, and Craver 2000, 13).

Activities of mechanisms play an important epistemic, i.e. explanatory, role because they are necessary for rendering the target happening intelligible (Machamer 2000). Intelligibility arises from a mechanism being represented in terms of bottom out entities and activities. On Machamer et al's view, a mechanistic explanation needn't be correct or accurate in order to give rise to intelligibility, so long as the representation of the mechanism shows,

“how possibly, how plausibly, or how actually things work. Intelligibility arises not from an explanation's correctness, but rather from an elucidative relation between the explanans (the set-up conditions and intermediate entities and activities) and the explanandum (the termination condition or the phenomenon to be explained),” (Machamer, Darden, and Craver 2000, 21).

Throughout this dissertation, I have assumed that knowledge is a cognitive state or activity. In this section, I have suggested that the role played by the concept of knowledge in science is providing explanations for phenomena. Machamer et al appear to operate under the assumption that explanation is closely tied to intelligibility or understanding. However, some philosophers of science argue that intelligibility and

understanding are not necessary for something to be an explanation. Trout (2007), for instance, refers to hyper complex models of speciation and disease, noting that these lack resources of familiarity to give rise to psychological states that are typically associated with understanding. Craver (2007) claims that Van Essen's hyper complex model of information processing in the visual cortex is an example of an explanation that we cannot cognitively represent.

Philosophers of science appear to be divided as to the question of whether understanding or intelligibility is required for something to constitute a scientific explanation. If understanding is not required for something to count as an explanation, and if knowledge is a cognitive state, then it seems implausible that the role of knowledge in science could be an explanatory role. But to determine what role knowledge plays in science, the best method would appear to be deferring to the judgments of actual practicing scientists, as these may differ from those of philosophers of science.

Waskan et al. (2013) have conducted a series of experiments that investigate whether laypersons and practicing scientists require of explanations that they render their target happening intelligible, where intelligibility amounts to an intellectual state of understanding how or why, at least possibly, a given phenomenon came about. They consider three hypotheses: the *objectivity hypothesis*, the *intelligibility hypothesis*, and the *intellig-ability hypothesis*. The objectivity hypothesis, applied to a population, is the claim that a population does not hold that psychological states are central to explanations. The intelligibility hypothesis is the claim that a population requires that an explanation *actually* render its target phenomenon intelligible, while the intellig-ability hypothesis

holds that a population only requires that an explanation have the *capacity* to render a happening intelligible, even if it does not actually do so.

Through their series of experiments, Waskan et al. have found that, contrary to the implication of the objectivity hypothesis, scientists and laypersons both appear to have a concept of explanation in which intelligibility plays a central role. Their data, in fact, tends to support the claim that, among these populations, actual, rather than potential, intelligibility is required of explanations. In other words, Waskan et al.'s research supports the intelligibility hypothesis over both the objectivity and intelligibility hypotheses.

While further research will be required to determine whether the intelligibility hypothesis tends to hold across the diversity of scientific disciplines, Waskan et al.'s research represents a novel method for the philosophical study of scientific explanation in that it defers to the judgments of practicing scientists (as well as laypersons) rather than only the judgments of philosophers of science. In other words, the data tends to support those in line with Machamer et al rather than those in line with Craver or Trout.

Due to Waskan et al.'s findings, it is consistent to assume both that knowledge is a cognitive state and that its role within science is an explanatory one. However, as noted above, Machamer et al suggest that explanations needn't be accurate. We can have explanations that show us how *possibly*, or how *plausibly*, a phenomenon comes about, rather than how *actually* that phenomenon occurs. So the role of knowledge in science appears to be, not merely being explanatory, but providing explanations that are accurate or correct. If this is correct, then epistemologists can take on the task of determining what knowledge amounts to in order to be suited to play this role.

Following Machamer et al's discussion, the target of a scientific explanation is a mechanism that is composed of entities and activities. We understand such a mechanism when we are provided with a representation of the mechanism that shows us how possibly, plausibly, or actually the mechanism works. However, since science aims, not only to provide explanations, but also to provide explanations that are accurate or correct, whatever plays the role of knowledge in science will have to be an accurate representation of a mechanism that gives rise to understanding or intelligibility.

While we have yet to articulate what knowledge must be if it is to play the role it appears to play in science, it already seems clear that the scientific role of knowledge is distinct from the role of knowledge in common sense or ordinary language. Recall, from the previous section that, under common sense, knowledge appears to play a role of providing warrant for action, i.e., a role of making action rational. This is clearly different from playing a role of rendering happenings or phenomena intelligible, i.e., of helping us to understand phenomena.

It should not be surprising that knowledge plays a different role in science than it does in common sense given that individual agents generally have different goals, resources, and limitations than practicing scientists, or even scientific institutions. In common sense, the epistemic agents of focus are generally individuals, and individuals are typically concerned with acting rationally in the face of all the practical constraints to which they are subject. In other words, knowledge is subservient to practical considerations. In these contexts, rationality is tied to effectiveness, and so accuracy will be sacrificed for increased effectiveness. This is generally not the case in science, where the goal is to maximize accuracy.

Let's take stock of where we are. Here, we are assuming that the role of knowledge in science is explanatory, where these explanations are maximally accurate. Moreover, Waskan et al's research suggests that explanations are, at least in part, psychological. Specifically, explanations are constituted by psychological states of intelligibility, that is, understanding how possibly, how plausibly, or how actually something works. Since science aims to provide explanations that are accurate or correct, the psychological state of main interest in this context will be that of understanding how *actually* something works.

While further work will be needed to determine what a psychological state of understanding how something works amounts to, Machamer et al's discussion, combined with Waskan et al's research, provides grounds for an initial sketch. In Machamer et al's discussion, the assumption appears to be that the main objects that science aims to explain are mechanisms, which are composed of entities and activities. We understand a mechanism through representations of those mechanisms, representations that illustrate how the mechanism in question works.

In addition to Waskan et al.'s findings, Stephen Grimm (2010) provides compelling arguments in favor of the claim that the goal of scientific explanation is to generate understanding. Moreover, Grimm provides what is, at the very least, a preliminary account of that to which the relevant psychological state of understanding amounts. To present his account, Grimm draws on an example in which two friends are observing a pilot practice takeoffs and landings. We are to imagine one friend asking the other, "Why can this plane fly?" In this case, the goal of an explanation of this occurrence is to allow us to understand why the plane can fly. In particular, on Grimm's account, the

goal of an explanation in this case will be to bestow to the relevant agent a grasp of Bernoulli's principle, and to be able to apply the principle to the relevant details about the plane (2010, 341).

On Grimm's view, in order to understand why the plane can fly, it is not sufficient to simply know Bernoulli's principle, and the specific details about the particular plane. This is because one can know all of these things, but fail to apply them to the question of why the plane can fly. Due to this problem, Grimm thinks that understanding, in this case, requires *grasping* the answers to the question, and this grasping entails having an ability to put the correct answer to use (2010, 341). In the plane example, grasping Bernoulli's principle entails having the ability to foresee how changes in values of variables lead to changes in values of other variables, and having the ability to apply the principle to specific circumstances. Grimm writes,"

For example, suppose I believe that because the shape of this airplane's wings is raised along the top and flat along the bottom, the air traveling across the top of the wing will speed up to meet the air traveling along the bottom of the wing. If I have grasped Bernoulli's principle, and if I then apply the principle to this case, what I will "see" (or, more cautiously, "seem to see") is that, given that the air traveling across the top of the airplane's wing is moving at a higher velocity, the pressure exerted by the air on the top of the wing will decrease. Moreover, I will "see" (or at least seem to see) that since the pressure exerted by the slower moving air along the bottom of the wing will then be greater than the pressure exerted along the top of the wing, lift—in other words flight—will result (Grimm 2010, 341).

This example, and the surrounding discussion, raises a couple of important points. First, as Grimm himself notes, the ability to anticipate how changes in values of variables leads to changes in values of other variables and having the ability to apply the principle to specific cases appears to be one and the same ability. Lacking the ability to manipulate

variables in the principle surely entails lacking the ability to apply the principle to specific instances.

Second, Grimm's use of the term "see" suggests that grasping the answers to the question of why the plane can fly involves non-propositional content. Whether or not this is Grimm's intention is admittedly unclear. Perhaps he means that when we grasp Bernoulli's principle and apply it to the case at hand, I am able to infer the proposition that "the air traveling across the top of the airplane's wing is moving at a higher velocity, the pressure exerted by the air on the top of the wing will decrease."

Regardless of Grimm's intentions in using "see" in the way that he does, the considerations that were raised in the doxastification section suggest that grasping answers to why-questions in the sense that is the goal of explanation will require having access to non-propositional content, such as a diagram or blueprint of an airplane. To reiterate a key point of the doxastification section, one can know Bernoulli's principle and various specifications of a particular airplane without having a clue as to how they apply to concrete circumstances. All that this would require is reading, or being told, what the principle states and what the specifications of the airplane amount to. Having the ability to apply and manipulate the principle will require something more. As I argued in chapter 2, skills and abilities generally require possessing information that cannot be acquired or represented linguistically. If understanding phenomena through explanations amounts to having certain skills or abilities, then there is no reason to think that these skills require only propositional information. If we think of explanations in mechanistic terms, then some of the information that is needed will plausibly be visual or diagrammatic, that is, information that allows us to perceive a "fit" of sorts between the

relevant elements. As Wayne Riggs puts it, “An important difference between merely believing a bunch of true sentences within subject matter M, and having understanding of M, is that one somehow sees the way things fit together. There is a pattern discerned within all the individual bits of information of knowledge (2003, 218).

We are now, I believe, in a position to offer a rough characterization of what role knowledge plays in science, and what knowledge needs to be if it is to play such a role. In science, knowledge plays the role of rendering happenings intelligible, that is, of providing explanations for phenomena. More specifically, knowledge plays a role of providing correct or accurate explanations. To have knowledge then, within the scientific domain, amounts to possessing an accurate or correct explanation. Waskan et al and Grimm provide reason to hold that possessing an explanation in the relevant sense entails understanding, of finding intelligible, the target phenomenon. If Grimm is correct, then finding a happening intelligible amounts to having a certain grasp, ability, or skill, that is, having know how of a particular sort. This appears to be one feature that scientific and common sense or ordinary language knowledge have in common – they both appear to require having the ability or skill to apply information in certain ways. Of course, the way in which information is applied in everyday contexts will generally be different from the way in which it is applied in scientific contexts.

Before concluding this chapter, one further complications needs to be addressed. The complication is that science is generally an institutional or collective endeavor. At the individual level, it appears that the cognitive state that plays the role of knowledge in science will be that of a state of understanding, which Grimm suggests entails having certain skills or abilities. But since science is generally a collective enterprise, following

the present proposal will require developing an account of understanding, ability, and skill that makes sense when applied to collective cognitive systems. At present, I am not sure what such an account will look like. However, there are at least two obvious possibilities.

One possibility is that at the collective or institutional level, understanding, skill, and ability are to be understood in roughly the same manner as they are understood at the individual level. For example, we might understand the utterance, “Science understands how planes fly” as serving as shorthand for the claim that a sufficient number of individual scientists, or a sufficient number of members of a subset of scientists, understand how planes fly.

A second possibility would be that in order for science to understand a phenomenon, it could be the case that different scientists, or collections of scientists, understand different components of that phenomenon. Perhaps none of the scientists, or groups of scientists, understands the phenomenon in full, but if we sum together the individual components that they do separately understand, we will arrive at a full understanding of the phenomenon under consideration.

If the suggestions offered in this section are correct, then they constitute further support for the claim that epistemology stands in need of revision. The traditional epistemological framework is not equipped to evaluate knowledge under the role it plays in science and this role is distinct from the role that it plays in common sense. Hence, we have further need for epistemological specialization and fragmentation.

CHAPTER 5

SUMMARY AND CONCLUSION

In this dissertation I have argued that the framework under which epistemology operates should be broadened to account for developments in cognitive science that indicate that a good deal of cognition and reasoning involves the use of non-linguistic representations.

In chapter 1, I argue that, although epistemology is the theory of knowledge, epistemologists generally operate as though their field is simply the theory of *propositional* knowledge. Epistemologists generally assume that knowledge is a certain type of belief relation to a true proposition. However, cognitive science indicates that many of our mental representations are not belief-like at all, and thereby, not belief relations to propositions. Rather, the mind employs representations that take the form of images, scale models, activation patterns, and so on. I call this claim *representational pluralism*. If some of these non-linguistic representations are constitutive of knowledge, as I argue in later chapters that they are, then this requires a substantial revision of the traditional epistemological framework. I proceed to introduce some potential consequences of departing from the propositional knowledge tradition in epistemology. These consequences pertain most directly to two issues, namely, philosophical methodology and our understanding of normative standards of rationality.

My discussion of methodological issues begins with the introduction of the *analysis problem*. The analysis problem is the problem of developing a conceptual analysis of propositional knowledge and justified belief. I argue that this problem

emerged from concerns with skeptical regress arguments and the Gettier problem. The traditional methodology for analyzing these concepts, and hence, for addressing the analysis problem, has consisted in determining the truth conditions for attributions of knowledge and justified beliefs. To determine these truth conditions, epistemologists develop thought experiments designed to elicit our semantic intuitions regarding the use of “knowledge,” “justified belief,” and their respective cognates. After enough intuitions are elicited, we formulate a theory of knowledge or justification.

While this methodology is problematic in its own right, as I argue in chapters 2 and 3, it has also lead to the embrace of an understanding of rationality that is limited and narrow in its application. Rationality amounts to epistemic constraint satisfaction and epistemic constraints provide criteria that allow us to assess an agent’s behavior for good or correct performance. Good, or correct, performance must be understood relative to a specific goal or problem. Since epistemology assumes that knowledge is a certain belief relation to a true proposition, the goal or problem of concern in epistemology is that of forming true beliefs. So, when epistemologists think about rationality, they think of behaving in a way that is conducive to forming true beliefs. In other words, the standards of rationality that epistemologists use to evaluate agents for rationality apply only to agents who exhibit behavior that is aimed at forming true beliefs. So, one reason that the traditional understanding of rationality in epistemology is problematic is because it is inapplicable to agents who have other goals, both epistemic and practical.

The second problem I discuss for epistemology’s traditional understanding of rationality is that the standards of rationality are formulated in abstract conditions that idealize away from various practical constraints to which we are constantly subject. It is

important to keep in mind that this second problem is, in some sense, orthogonal to the first, although it arises, at least at times, from the standard epistemological methodology. Nevertheless, even if the traditional epistemological framework is correct in holding that all knowledge is belief-like, epistemology's traditional standards of rationality are inapplicable to any actual individuals because actual individuals are finite creatures with fixed cognitive architectures. Since epistemology's traditional standards of rationality are formulated in idealized conditions that abstract away from these limitations, they should be understood as guiding the behavior of agents who exist in those sorts of environments. But agents who exist in those sorts of environments will be subject to more demanding standards than actual agents. Actual agents, of course, cannot meet these standards, and, since ought implies can, cannot be held to them.

In short, chapter 1 argues that we need to depart from the epistemological status quo in order to accommodate the possibility of non-belief-like, that is, non-propositional knowledge. The dissertation proceeds to explore some of the consequences of this departure, specifically the consequences for philosophical methodology and our understanding of rationality in epistemology.

In chapter 2 I discuss knowledge-how, a type of knowledge that many have argued is non-propositional. In the first part of the chapter I discuss two intellectualist positions, that is, positions that hold that know-how is propositional. Stanley and Williamson argue that propositional knowledge is both necessary and sufficient for know-how, while Bengson and Moffett argue that propositional knowledge is not sufficient, but is necessary, for know-how.

Stanley and Williamson's position is that knowing how to X amounts to knowing, under a practical mode of presentation, that some way is a way for one to X. Against their position, I argue that if practical modes of presentation do the work that is required of them, then positing them amounts to granting that non-propositional knowledge is necessary for know-how. According to Stanley and Williamson, practical modes of presentation explain the connection between know-how, dispositions, and actions. However, these dispositions are presumably those that enable performance, and in order to have these dispositions, I argue that we need to practice the activity in question. Through this practice, we acquire the content that gives rise to the relevant dispositions. Following representational pluralism, it is highly implausible that this content is always, or even typically, linguistic or propositional. Hence, positing practical modes of presentation amounts to positing non-propositional content.

Bengson and Moffett concede that there is a non-propositional element that is necessary for know-how. Specifically, they argue that in order to know how to X, one has to stand in a non-propositional knowledge relation to a way of X-ing. However, they also argue that knowing how to X requires propositional knowledge because one can stand in a non-propositional relation to a way of X-ing without knowing that it is a way of X-ing, and thereby fail to know how to X. As I argue, their position entails that many clear-cut cases of knowing how are not cases of knowing how because the relevant agents do not know that, that is, have propositional knowledge the way in which they X is the way in which they X. Taken together, my discussion of Stanley and Williamson and Bengson and Moffett shows that propositional knowledge is neither necessary nor sufficient for know-how.

The second half of chapter 2 discusses the origins of the contemporary know-how debate going back to Gilbert Ryle. I argue that, since Ryle's time, two debates have been taking place in the know-how literature: one regarding the semantic analysis of know-how ascriptions, and another regarding how we ought to explain various skills or abilities. The first debate is concerned with truth conditions for sentences such as, "Hannah knows how to ride a bicycle," while the latter debate is concerned with determining whether skills are the result of applying a "theory" or stored propositional knowledge, or are the result of the processing of non-linguistic information.

Unfortunately, these debates have been entangled in the literature. For instance, some philosophers, including Stanley and Williamson, Bengson and Moffett, and Ryle, have made inferences about how we ought to explain skills or abilities on the basis of semantic analyses of know-how ascriptions or appeals to ordinary language. Both of these strategies assume that intuition driven semantic analysis gives us the correct truth conditions for sentences that use mental terminology and that scientific accounts of the mind are beholden to language. In other words, these strategies amount to what Martin Roth and Robert Cummins call *epistemological poaching*.

As an alternative approach that disentangles these debates, I argue that the representational pluralist thesis needs to be taken seriously. The use of epistemological poaching tacitly assumes that the thesis is false and that cognition is structured around a language of thought that has a similar structure to natural language. Taking representational pluralism seriously can allow epistemology to develop a broader, yet more specialized, framework that bridges the longstanding gap between the field and empirical approaches to understanding knowledge.

In chapter 3 I argue that epistemology's failure to take representational pluralism seriously has skewed the field's understanding of normative standards of rationality. I discuss two ways in which epistemology's normative standards of rationality are limited. First, they apply only to agents with purely linguistic or belief-like cognitive systems. Second, they apply only to cognitive systems that are capable of meeting them, due to what I call the *ought-can principle*.

But before discussing these limits on epistemology's normative standards of rationality, I consider one way in which a proponent of traditional epistemology might try to argue that representational pluralism does not require substantial revision of epistemology's framework. I label this type of argument the *doxastification strategy*.

Before discussing the doxastification strategy in depth, I present prima facie evidence for what I call *epistemological pluralism*, the thesis that there are many types of knowledge, many of which are non-propositional. The first type of prima facie evidence for epistemological pluralism comes from representational pluralism. If representational pluralism is true, there appears to be no reason to hold that only linguistic representations can be constitutive of knowledge.

The second type of prima facie evidence comes from semantics. We often make knowledge attributions in which it appears the thing known is not a proposition. For instance, we say things like, "Jones knows how the New York subway system is laid out," or "Jones knows what "God Only Knows" sounds like. In the first case, the thing known appears to be, not a proposition, but the layout of a subway system. In the second case the thing known appears to be, not a proposition, but the sound of a song.

Taken together, we can take semantic data to give us an indication as to what sorts of things qualify as objects of knowledge. Meanwhile, the psychological evidence provides us with insight regarding how these objects are mentally represented. The layout of a subway system is naturally represented by a map, while the tune to a song is naturally represented in auditory memory or in a score. Hence, it appears, at least *prima facie*, that we have knowledge that is, in part, comprised of non-linguistic mental representations.

One might, however, employ the doxastification strategy to argue that we can understand these cases of apparent non-propositional knowledge in terms of propositional knowledge. When one knows, for instance, how the New York subway system is laid out, what one knows is a proposition, namely, the proposition that *the New York subway system is laid out like this*, where “this” refers to a map of the subway system.

However, the doxastification strategy divorces the content that does the genuine evidential work, and behavioral control, from the content of what is known. Certainly knowing how the New York subway system is laid out allows one to know that the subway system is laid out like *this* (again, where “this” refers to a map of the subway system). But the problem is that one can know this proposition without having any idea how the New York subway system is laid out. One can be reliably informed that the map in question accurately represents the subway system’s layout without ever taking a look at the map and thereby know that the subway system is laid out like *that*. But in order to know how the subway system is laid out, one needs access to an actual representation of the system, that is a map (mental or otherwise).

After discussing doxastification, I argue that the problems with epistemology's standards of rationality can be resolved by reconciling the field with the relevant findings in cognitive science, that is, findings that support representational pluralism. I argue that the current standards of rationality in epistemology apply neither to individuals nor to collectives or institutional cognitive systems. These standards cannot be applied to the individual because doing so violates the principle that ought implies can. In other words, these standards require that individuals exceed their capacities. These standards cannot be applied to institutions, such as the institution of science, because they are not equipped to evaluate the use of non-linguistic representations that is ubiquitous in scientific reasoning.

Next, I discuss several problems with traditional methodology in epistemology, and motivate an alternative approach. The first problem is that it is not clear what the target of a conceptual analysis of knowledge is. If one thinks we need an analysis that is correct in all possible worlds, then it is not clear what could possibly constrain such a project. Though appealing to intuition is a standard approach, there does not appear to be any reason to think that intuitions are equipped to provide any evidential support for a theory of knowledge. I argue that, instead of pursuing an analysis of knowledge in the traditional manner, we should ask what role knowledge plays in the various domains in which it is employed.

In chapter 4, I examine the role that knowledge plays in two domains: everyday life and the institution of science. In everyday contexts, I argue that knowledge plays a warrant-granting role for action. This way of thinking about knowledge has drawn some attention in the epistemology literature from Keith DeRose, Jason Stanley, John

Hawthorne, and Jeremy Fantl and Matthew McGrath, amongst others. However, I argue that none of these “pragmatic encroachment” approaches draw the correct connection between knowledge and practical affairs. In particular, many of these accounts are designed to be supplements to more traditional, independent accounts of knowledge.

Rather, I suggest, that in order to take pragmatic encroachment seriously, knowledge needs to be understood as that which plays the role of making an action rational under realistic conditions in which time and memory are limited. That which makes an action rational is often different than that which makes a belief rational. Forming beliefs is generally low risk, that is, there is little cost that comes with being wrong. The cost of being wrong comes into play only when we act on beliefs. But when we are simply concerned with the formation of beliefs, and not how we ought to act on beliefs, the risks we undertake are generally minimal. Because of these differences, the formation of beliefs is subject to different standards of rationality than is acting on beliefs.

When we are genuinely concerned with determining how to act, standards of rationality must be sensitive to limits of time, memory, information, and other resources. Hence, I argue, drawing on work by Gigerenzer and Goldstein, that what makes an action rational in everyday contexts is not a proposition that is known in the traditional philosophical sense, but rather the use of an effective algorithm or set of heuristics.

If this is correct, then knowledge, as understood in traditional epistemology, cannot fill the role that knowledge plays in everyday contexts. Though propositions can serve as inputs into a decision-making procedure, it is effective use of the procedure itself

that makes an action rational. In other words, it is an algorithm or decision procedure that fills the role that knowledge plays in everyday contexts.

It is true, of course, that in everyday circumstances, knowledge is often used or discussed in a way that is much closer to the way it is understood in standard epistemology. It does not seem out place in everyday contexts to say, for instance, that I know that Jefferson City is the capital of Missouri. I take this to suggest that we need to understand knowledge in a pluralistic way. While I do think knowledge is often used in everyday contexts to justify or criticize action, it is unlikely that this captures all uses. Ultimately, the issue of what role knowledge plays in commonsense is an empirical question, and so it would be most desirable to accumulate a set of linguistic data to give us a clearer sense of the different roles the concept plays in ordinary usage.

In scientific contexts, I argue that, because science aims to provide us with an understanding of the world, the role that knowledge plays in science is an explanatory role. However, it is possible to have an explanation for a phenomenon that is not correct or accurate. Such an explanation demonstrates, not how *actually* a phenomenon occurs, but rather how *possibly* or how *plausibly* the phenomenon occurs. Since science aims to provide theories that are not only explanatory, but also correct or accurate, the role of knowledge in science is that of an accurate explanatory role.

I begin by noting that Hempel's Deductive-Nomological account of explanation and some subsequent accounts assume explanations are sentence-like in structure. But more recently, many philosophers of science have taken a mechanistic approach to explanation. Machamer, Darden, and Craver, for instance, hold that representations of mechanisms for phenomena explain those phenomena. They note that we use diagrams to

represent features of mechanisms, and these diagrams allow us to more easily apprehend the phenomena than linguistic descriptions.

While some philosophers of science, such as Carl Craver and J.D. Trout, deny that explanations have to render their target happenings intelligible, Waskan e al. present compelling empirical evidence that this view is not shared by practicing scientists. Rather, it appears that both scientists and laypersons have a concept of explanation in which intelligibility plays a central role. This supports Machamer, Darden, and Craver's claim that representations of mechanisms render their target happenings intelligible.

There is still a good deal of work to be done to determine the psychological nature of intelligibility or understanding. However, Stephen Grimm suggests that understanding a phenomenon requires having a grasp of the relevant scientific principles and the ability to apply these principles to specific cases. If knowing how entails possessing content that gives rise to dispositions that enable us to perform various abilities, as I argue in chapter 2, then Grimm provides some reason for thinking that know-how is a central component to understanding.

So if scientific knowledge plays the role of explaining the world, and explanations must render the world intelligible, then it appears that the role of knowledge in science is filled by that which enables us to have a correct or accurate understanding of the world. If this is correct, then the role that knowledge plays in science is clearly different than the role it plays in everyday contexts. In everyday contexts, knowledge provides warrant for action. In science, knowledge explains the world by rendering it intelligible. This difference should be unsurprising given that individuals have different goals, resources, and limitations than practicing scientists, or even scientific institutions.

However, one common feature that knowledge in science and everyday life appear to have in common is that they are both related to abilities or skills. In some everyday contexts, knowledge takes the form of a decision procedure or algorithm. Having propositional information that can serve as an input to an algorithm alone does not provide sufficient warrant or assurance that a certain course of action is rational. To have a sufficient degree of warranty, one also needs an effective procedure for processing or utilizing that information. To put it slightly differently, it appears that *knowing how* to put the information at one's disposal to practical use is essential for making a course of action rational. In scientific contexts, knowledge plays the role of enabling us to understand the world, and if Grimm is correct, then understanding consists, at least in part, of a kind of knowledge-how.

There is one final complication that I discuss at the end of the chapter. The complication is that science is generally an institutional or collective endeavor. At the individual level, it appears that the cognitive state that plays the role of knowledge in science will be that of a state of understanding, which Grimm suggests entails having certain skills or abilities. But since science is generally a collective enterprise, following the present proposal will require developing an account of understanding, ability, and skill that makes sense when applied to collective cognitive systems. At present, I am not sure what such an account will look like. However, there are at least three obvious possibilities.

One possibility is that at the collective or institutional level, understanding, skill, and ability are to be understood in roughly the same manner as they are understood at the individual level. For example, we might understand the utterance, "Science understands

how planes fly” as serving as shorthand for the claim that a sufficient number of individual scientists, or a sufficient number of members of a subset of scientists, understand how planes fly.

A second possibility would be that in order for science to understand a phenomenon, it could be the case that different scientists, or collections of scientists, understand different components of that phenomenon. Perhaps none of the scientists, or groups of scientists, understands the phenomenon in full, but if we sum together the individual components that they do separately understand, we will arrive at a full understanding of the phenomenon under consideration.

A third possibility is that scientific knowledge should be understood in a way that is wholly distinct from the way in which we understand knowledge or understanding in individuals. Rather, we need to take seriously the idea that various scientific institutions are themselves epistemic agents. This is similar to the way in which the law treats corporations, partnerships, and governments as agents. Agents of this sort have different abilities, goals, and resources than the agents of which they are composed. They are also subject to different constraints than their component agents. Different temporal, memory, and computational constraints will be in effect.

If the suggestions offered in this section are correct, then they constitute further support for the claim that epistemology stands in need of revision. The traditional epistemological framework is not equipped to evaluate knowledge under the role it plays in science and this role is distinct from the role that it plays in common sense. Hence, we have further need for epistemological specialization and fragmentation.

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