An Open and Shut Case:
Epistemic Closure in the Manifest Image[*]

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> *When one door is closed, don't you know, another is open.*
> — Bob Marley

Abstract: The epistemic closure principle says that knowledge is closed under known entailment. The closure principle is deeply implicated in numerous core debates in contemporary epistemology. Closure's opponents claim that there are good theoretical reasons to abandon it. Closure's proponents claim that it is a defining feature of ordinary thought and talk and, thus, abandoning it is radically revisionary. But evidence for these claims about ordinary practice has thus far been anecdotal. In this paper, I report five studies on the status of epistemic closure in ordinary practice. Despite decades of widespread assumptions to the contrary in philosophy, ordinary practice is ambivalent about closure. Ordinary practice does not endorse an unqualified version of the epistemic closure principle, although it might endorse a *source-relative* version of the principle. In particular, whereas inferential knowledge is not viewed as closed under known entailment, perceptual knowledge might be.

Keywords: knowledge, social cognition, perception, inference, philosophical method, folk epistemology, Wilfrid Sellars

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1. Introduction

In its simplest form, the epistemic closure principle states that, necessarily, if you know that P, and you know that if P then Q, then you also know that Q. Or, at least, you would then be in a position to easily know Q by simple inference. Modifications to the principle have been proposed in response to various problems, both obvious and technical. But these problems won't concern us here, so we'll stick with the simple formulation.

The epistemic closure principle lies at the crossroads of many currents in the theory of knowledge. Many tout it as a linchpin in the most compelling skeptical arguments (e.g. Stroud 1984). Some rely on it to motivate contextualist hypotheses about the semantics of knowledge attributions (DeRose 1995; Cohen 1999). And others appeal to it in the course of motivating views about the relationship between knowledge and practical interests (e.g. Hawthorne 2004). If epistemic closure fails, then the landscape of contemporary epistemology will need to be reconfigured.

1.1. Two arguments against closure

There are two main arguments against the epistemic closure principle. The first argument is that it is "the *only* way to avoid skepticism" (Dretske 2013: 32). Suppose that George is standing in front of an audience waving his hands around while rehearsing a provocative proof (Moore: 1959: ch. 7; see also Stine 1976). The skeptic argues:

1. If George knows that he's standing up, then he knows that he's not merely dreaming that he's standing up.

2. But George doesn't know that he's not merely dreaming that he's standing up.

3. So George doesn't know that he's standing up.

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Some anti-skeptics respond:

1. If George knows that he's standing up, then he knows that he's not merely dreaming that he's standing up.

2*. And George does know that he's standing up.

3*. So George knows that he's not merely dreaming that he's standing up.

Despite ending up with radically different conclusions, our skeptic and anti-skeptic start from the same place, namely, by accepting that if George knows that he's standing up, then he knows that he's not merely dreaming. A shared commitment to the epistemic closure principle explains the common starting point of the two arguments. The skeptic and anti-skeptic then make different use of that shared conditional premise. The skeptic relies on the intuition that George can't know that he isn't just dreaming and then concludes that George doesn't know that he's standing up; the anti-skeptic relies on the intuition that George knows that he's standing up and then concludes that George does know that he isn't merely dreaming.

Dretske (1970) and Nozick (1981) advocate a dramatically different response to the skeptic. They *accept* that George doesn't know that he isn't merely dreaming (line 2 of the skeptic's argument). At the same time, they *accept* that George knows that he's standing up (line 2* of the anti-skeptic's argument). Dretske and Nozick reconcile both of those things by *rejecting* line 1 of each argument. That is, they deny that if George knows that he's standing up, then George knows that he isn't merely dreaming.

By giving up the epistemic closure principle, we "grant the skeptic a partial victory" (Nozick 1981: 270). Some think that the victory is well earned because it strikes us as a "suspicious" exercise in "bad faith" to claim that we know that we're not merely dreaming (Nozick 1981:

264). Nevertheless, the victory is only partial because the failure of epistemic closure prevents skepticism from corroding our knowledge of important day-to-day matters: "We can have most of our cake (the only part worth eating) and eat it too" (Dretske 2005: 19).

Although this is *a* way to respond to the skeptic, it is certainly not *the only* way to do so. For instance, contextualists have argued that their own response to skepticism is better because it not only lets us count many ordinary knowledge attributions as true, but it also allows us to retain the epistemic closure principle (DeRose 1995; Lewis 1996; Cohen 2013). And there are non-contextualist responses that diagnose the skeptic's mistake in terms of a subtle modal fallacy (Sosa 1999) or a pragmatic confusion about illocutionary force or the norms of speech acts (Turri 2010a; Turri 2012; Turri 2014a).

There is a better argument against the epistemic closure principle (traceable in some form to Dretske 1970; see Turri 2014b: §19). If a propositional attitude is closed under known entailment, then the following conditional is true: if you have the attitude toward P, and you know that P entails Q, then you also have that same propositional attitude toward Q. I regret that I attended a play last night. I also know that if I attended a play last night, then I existed last night. From these two facts does it follow that I regret that I existed last night? Far from it. Regret isn't closed under known entailment. The same is true for other propositional attitudes. Gilmore might be happy that his sister's broken arm is healing quickly, and Gilmore knows that if her broken arm is healing quickly, then her arm was broken, but he's not happy that her arm was broken. I might be surprised (or angry, or sad) that James won the competition, and I know that if James won, then someone won, but I'm not surprised (or angry, or sad) that someone won. Similar remarks apply to other mental states, such as perceiving or remembering.

Setting knowledge aside so that we don't beg the question, there isn't a single propositional attitude that is closed under known entailment. (On certain formulations of closure, belief might be an exception to this generalization.) But knowledge is a propositional attitude. So, absent special considerations to the contrary, it's likely that knowledge isn't closed under known entailment either. Without a special reason to do so, we should not treat knowledge differently from its kindred.

1.2. Two arguments for closure

That brings us to the two main arguments in favor of closure. First, closure's proponents point out that competent deduction from known premises is "in general a way of coming to" know one's conclusion, of "extending one's knowledge" (Williamson 2000: 117; Hawthorne 2004: 33; Stanley 2005: 18-20, 94). The epistemic closure principle is then glossed as a way of "articulating" this "extremely intuitive idea" about competent deduction (Hawthorne 2004: 33). But this train of thought is far too hasty. Nothing so strong as a necessarily true generalization is needed to vindicate the general epistemic efficacy of competent deduction. Saving and investing prudently is in general a way of retiring comfortably, but there are of course exceptions (compare Turri 2010b). It seems likely that there is a more modest explanation for the efficacy of deduction. We should rule out more modest explanations before reaching for a necessarily true generalization.

Second, and much more commonly, closure's proponents rely *heavily* on the claim that epistemic closure is a defining feature of ordinary thought and talk about knowledge — that is, of folk epistemology. As Barry Stroud puts it, epistemic closure is "just a familiar fact about human knowledge, something we all recognize and abide by in our thought and talk about knowing

things": "anyone who speaks about knowledge and understands what others say about it will re-cognize" this (Stroud 1984: 18–19). (Actually, Stroud seems to have in mind a principle that is logically stronger than the epistemic closure principle as characterized above.) Stewart Cohen claims that the principle deserves to be called "axiomatic" (Cohen 1999: 69) and he defends his closure-based version of contextualism by appealing to "our intuitions" and the dispositions and judgments of "competent speakers" (Cohen 2013: 69, 71, passim; see also Feldman 1999; Williamson 2000; BonJour 2010). John Hawthorne claims that it's "very difficult to put oneself in a frame of mind" where one attributes knowledge in a way that violates the epistemic closure principle (2004: 38). Theoretical proposals to abandon closure are "revisionary" and suffer from "deep and wide-ranging" "conflict" with our "intuition" (Hawthorne 2004: 36). In light of all this, closure's proponents find it "striking" (Hawthorne 2004: 36) and "startling" (Fumerton 1987) that "some philosophers have gone so far as" to deny the principle and, in the process, "blatantly violate" such a "basic and extremely plausible intuition" (Steup 2005). They marvel at the "absurdity" of such a proposal — though they do admit that it's less absurd than "denying the transitivity of the *taller than* relation" (Hawthorne 2004: 38; compare Hawthorne 2013: 45).

Related to these claims about ordinary practice and the absurdity of denying closure in the abstract, philosophers have also claimed that conjunctive assertions which suggest a violation of closure are "abominable" (DeRose 1995). Such conjunctions include, "She knows that she has hands, but she doesn't know that she isn't a handless brain-in-a-vat," and, "He knows that his car is parked in the lot, but he doesn't know that his car hasn't been stolen."

This rather lavish gloss on ordinary practice and what "we" find intuitively compelling or conversationally "abominable" has thus far gone unchallenged, even by closure's opponents (No-

zick 1981: 205-6; Dretske 2013: 32). Thus it is widely assumed that closure's opponents bear the revisionist's burden of either explaining away contrary intuitions, or showing that their view delivers otherwise unattainable benefits.

1.3.   The state of the art and the way forward

The "only anti-skeptical game in town" argument against closure is underwhelming, as is the suggestion that closure is the only or best way to vindicate the epistemological efficacy of competent deduction. The best reason to reject the epistemic closure principle is the inductive argument from the fact that no other propositional attitude is closed under known entailment. Unless there is evidence that knowledge is somehow different, it's likely that knowledge is not closed under known entailment either. The best reason to think that knowledge is somehow different is that epistemic closure is a defining feature of folk epistemology and that abandoning it is repugnant to intuition and commonsense.

Participants on all sides of the debate accept that patterns in ordinary thought and speech are a valuable source of information which place vital constraints on theories in this area. For example, Jonathan Vogel aims for a theory of knowledge and epistemic closure that can "accommodate the body of our intuitions in an unforced, convincing way" (1990: 298). In laying out the "ground rules" by which we judge competing theories in this area, Hawthorne appeals repeatedly to what he views as "uncontroversial" and "widespread" "inclinations" to ascribe or deny knowledge in certain cases — that is, "our intuitive verdicts" (Hawthorne 2004: 7, 8, 12, et. passim; compare Cohen 2013: 71). And Dretske proposes that "ordinary, intuitive judgments" about a "set of clear cases" can be "used to test" competing hypotheses (1981: 92–3). Dretske even goes so far as to report results from his "own poll among nonphilosophers" (Dretske 1981: 249, n. 8).

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Although the claim that closure is a core principle of folk epistemology has gone unchallenged thus far, no serious evidence been produced in its favor. It is a straightforwardly empirical claim that ordinary practice exhibits such patterns. This claim has thus far been granted based on anecdotal evidence. But much better evidence is obtainable, so it is unwise to rest content with mere anecdote. At this point, the best way forward is to get better evidence.

In this paper, I investigate whether epistemic closure really is a core commitment of folk epistemology — that is, to paraphrase Stroud, whether the closure principle is "embodied" in our ordinary ways of thinking and talking about knowledge. If it is thus embodied, then the case for closure is strengthened. If it isn't, then the case for closure is seriously weakened and the inductive argument against closure prevails, at least for now.

In order to conduct this investigation, I'll rely primarily on a "car theft case" adapted from Vogel's influential work on epistemic closure. (Towards the end of the paper, I replicate the basic findings using a different cover story.) I also use two versions of the story that varied the *source of belief*. In addition to the long history in philosophy of emphasizing differences among the sources of knowledge (Priest 2007; Sgarbi 2012), this decision was motivated by recent research demonstrating that source of belief affects knowledge attribution (Turri 2014c; Friedman & Turri 2014). The two sources I chose to work with are perception and inference. I will return to the significance of differentiating sources in the Conclusion.

I should also like to emphasize that I will ultimately distinguish between *general* or *unqualified* versions of the closure principle, on the one hand, and *source-relative* versions of the principle, on the other. The philosophical debate has thus far focused on the unqualified version but, as will become clear, the evidence warrants a more fine-grained approach.

1.4. Two reasons to value the method

Some philosophers will immediately object, "When it comes to philosophical inquiry, it doesn't matter what ordinary people think. So this empirical investigation is worthless." This dismissive reaction is misguided, for two reasons.

First, for anyone even passingly familiar with the literature on closure over the past three decades, it's utterly obvious that empirical facts about ordinary practice *have mattered greatly* to serious philosophical debate on this topic. I am simply investigating rigorously what others have assumed to be true based on personal impressions and anecdote.

Second, and setting aside the particulars of recent philosophical theorizing about closure specifically, it's doubtful that ordinary thinking is irrelevant to philosophical theorizing, for two reasons.

On the one hand, philosophers are people too. It's naive to suppose that initiation into the vocation of philosophy insulates us from the habits and tendencies of the human condition. As Wilfrid Sellars once wrote, philosophers may "derive much of [their] sense of the whole from the pre-reflective orientation which is our common heritage" (Sellars 1963: 3). If some of those habits and tendencies lead us astray, then we should want to know whether they're influencing our theoretical reflections. A particularly striking example of this is the recent discovery of a human tendency called *excuse validation* (Turri 2013a; Turri & Blouw 2014). This is the surprising tendency to incorrectly view someone who *blamelessly breaks a rule* as having *not broken the rule at all*. When asked to evaluate a situation in which someone definitely breaks a rule but does so blamelessly, roughly half of people agree that a rule was broken, but equally many people disagree that a rule was broken. Those who disagree aren't being disingenuous or insincere. Rather,

their desire to excuse leads them to judge that no rule has been broken. (This is roughly the inverse phenomenon of *blame validation*, the well documented tendency whereby a desire to blame distorts factual judgments; see Alicke 1992; Alicke & Rose 2010.) It's surprising that people are so prone to misdescribing such cases. What's more, even in their most reflective moments, professional philosophers exhibit the same tendency. Excuse validation occurs in the highest reaches of contemporary philosophical debates. For instance, the most common objection to the knowledge account of assertion perfectly fits the mold of excuse validation (Turri 2013a).

On the other hand, some of the most illustrious and accomplished philosophers have argued that *distilling the defining features of ordinary thought* is an essential part of the philosopher's job. For example, according to Sellars, philosophy aims to "understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term" — that is, to find in all things "unity at the reflective level" (all Sellars quotes are from Sellars 1963: ch. 1, sections 2–4). As part of this, the philosopher is tasked with reconciling "the manifest image" — our ordinary ways of understanding the world and our place in it, "sophisticated common sense," our "pre-reflective orientation" and "heritage" — with the deliverances of scientific inquiry or "the scientific image." In order to do this, philosophy has to get the manifest image right, which is "a task of the first importance." Philosophy aims to "understand the structure of this image," so that we may "know [our] way around in it reflectively with no intellectual holds barred."

Sellars viewed "the great speculative systems of ancient and medieval philosophy," "the major schools of contemporary Continental thought," and "common sense" and "ordinary usage" philosophy as aiming for "more or less adequate accounts of the manifest image." Sellars also thought that recent "analytic" philosophy, especially as influenced by "the later Wittgenstein,"

had done "increasing justice to the manifest image," having made progress toward "isolating it in something like its pure form."

   Although the manifest image shapes and influences "philosophical thinking itself," the image has "an existence which transcends . . . the individual thought of individual thinkers." And because the image "transcends the individual thinker, *there is truth and error with respect to it*." Despite our intimate relationship with the manifest image, we can and do get it wrong.

   Sellars sums this all up nicely in the following memorable passage:

> Much of academic philosophy can be interpreted as an attempt by individual thinkers to delineate the manifest image (not recognized, needless to say, as such) — an image which is both immanent in and transcendent of their thinking. In this respect, a philosophy can be evaluated as perceptive or imperceptive, mistaken or correct, even though one is prepared to say that the image [it] delineate[s] is but one way in which reality appears to the human mind. And it is, indeed, a task of the first importance to delineate this image.

In light of this, I submit that Sellars would have strongly approved of the present investigation and, moreover, that much of the recent trend known broadly as "experimental philosophy" coheres seamlessly with the Sellarsian vision of philosophy's proper scope and method.

2.   Experiment 1: open and closed between-subjects

2.1.   Method

Participants ($N = 145$)[1] were randomly assigned to one of four conditions in a 2 (Source: Percep-

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[1]   Sixty-three female, aged 18–69 years, mean age $= 29.7$ years; 92% reporting English as a native language. Participants were recruited and tested using an online platform (Amazon Mech-

tion, Inference) × 2 (Content: Positive, Negative) between-subjects design. Participants in each condition read a single story. The Source factor manipulated source of belief. The Content factor manipulated which of two statements participants were asked (Positive: the person knows where the car is parked; Negative: the person knows that the car has not been stolen). Here is the story, with the difference between Perception and Inference conditions bracketed and separated by a slash:

> (Perception/Inference) When Mr. Maxwell arrives at work in the morning, he always parks in one of two spots: C8 or D8. Half the time he parks in C8, and half the time he parks in D8. Today Maxwell parked in C8. ¶[2] It's lunchtime at work. Maxwell and his assistant are up in the archives room searching for a particular document. Maxwell says, "I might have left the document in my car." The assistant asks, "Mr. Maxwell, is your car parked in space C8? It's not unheard of for cars to be stolen." ¶ Maxwell [looks carefully out the window / thinks carefully for a moment] and then responds, "No, my car has not been stolen. It is parked in C8."

After reading the story, participants were instructed, "Please read the statements below and check all that are true in the story you just read." Each participant was presented with three statements. Participants in all conditions received statements [2] and [3]; participants in Positive conditions also received statement [1P]; participants in Negative conditions also received statement

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anical Turk + Qualtrics) and compensated $0.30 for approximately 2 minutes of their time. Participation was restricted to United States residents. Participants were not allowed to re-take the survey; repeat participation was prevented by screening AMT Worker IDs. They filled out a brief demographic survey after testing.

[2]   Indicates paragraph break on the participant's screen.

[1N]. (I use numerical labels for expository convenience; participants never saw the labels.)

[1P] Maxwell knows that his car is parked in C8.

[1N] Maxwell knows that his car has not been stolen.

[2] Maxwell is in the archives room.

[3] Maxwell is in his assistant's office.

The order of the statements was rotated randomly.

I will interpret participants in Positive conditions as ascribing to Maxwell knowledge that the car is parked in C8 if and only if they select option [1P]. Similarly I will interpret participants in Negative conditions as ascribing to Maxwell knowledge that the car has not been stolen if and only if they select option [1N]. For convenience, I will use the following terminology:

- People who selected option [1P] *ascribed positive knowledge*.
- People who selected option [1N] *ascribed negative knowledge*.

Nine participants who either omitted option [2] or selected option [3] were excluded from the analysis, on the grounds that they were not reading the story carefully enough. Including data from these participants didn't affect the results reported below.

2.2. Results and discussion

If epistemic closure is a principle of folk epistemology, then participants should not ascribe positive knowledge significantly more frequently than they ascribe negative knowledge. By contrast, if they do ascribe positive knowledge more frequently, then that is evidence that epistemic closure is not a principle of folk epistemology.

The results were absolutely clear: participants ascribed positive knowledge significantly more frequently (Figure 1). But higher positive attribution occurred only in the Inference condi-

tion (92% / 42%, Fisher's exact test, *p* < .00001, Cramer's V = .528, all tests two-tailed). In the Perception condition, rates of negative attribution were slightly higher, though the difference was not significant (95% / 88%, Fisher's exact test, *p* = .411, n.s.). Rate of knowledge attribution in the Positive Inference condition didn't differ significantly from rates in either the Positive Perception (Fisher's exact test, *p* = .699) or Negative Perception conditions (Fisher's exact test, *p* = 1). It was the Negative Inference condition that differed from the other three.[3]
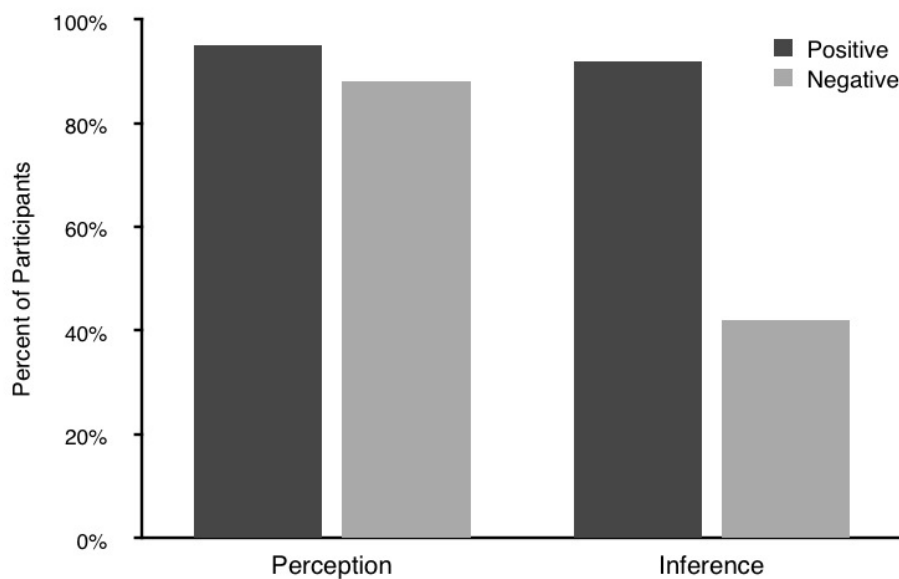

Fig. 1. Experiment 1. Percent of participants attributing knowledge across four conditions.

These results are strong initial evidence that epistemic closure is not a principle of folk

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[3] In a logistic regression model that included Source, Content, and the interaction term Source*Content as predictors and knowledge *denial* as the outcome, only the interaction Source*Content significantly predicted knowledge denial, recording an odds ratio of over 37. This means that when changing the content of Maxwell's belief from positive to negative, the odds of denying knowledge increased *over 37 times more* for inferential belief than for perceptual belief. See Appendix 1. (Compare the results reported in Turri 2014b.)

epistemology. However, it could be objected that because participants in the Positive and Negative conditions were presented with different sets of statements, they interpreted those statements in relevantly different ways. In response to this objection, first, I note that if the positive and negative knowledge statements themselves precipitated a relevant change in context, then we would expect that to happen in *both* Inference and Perception conditions. But there is no evidence that this happened to participants in Perception conditions. So the objection seems unlikely to be correct. Second, and setting aside the first response entirely, the next section reports an experiment that avoids the objection by simultaneously presenting both knowledge statements to all participants.

3.   Experiment 2: open and (almost) closed within-subjects

A between-subjects design is potentially open to the worry that the questions themselves precipitate a relevant change of context. Perhaps just asking about car-theft discourages knowledge attribution in a way that mentioning car-parking does not. If that's right, then a between-subjects design can't control for the change of context caused by the difference in questions asked. Given the amount of attention paid to contextualist epistemology over the past two decades, we shouldn't ignore this possibility (Unger 1984; Cohen 1988; DeRose 1995; Lewis 1996). Accordingly, in this experiment I adopt a within-subjects design in which all the participants are asked about both knowledge attributions.

3.1.   Method

Participants ($N = 123$)[4] were randomly assigned to one of two conditions, Perception and Infer-

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4   Thirty-six female, aged 18–73 years, mean age = 30.5 years; 95% reporting English as a na-

ence. The stories and procedures were exactly the same as in Experiment 1, except for one important difference: each participant was presented with both the positive and negative knowledge statements (i.e. 1P and 1N from Experiment 1). I excluded data from 5 participants who failed comprehension questions. Including data from these participants doesn't change the pattern of results reported below.

3.2. Results and discussion

If the objection considered against Experiment 1 has merit, then in this experiment positive knowledge attribution should not be significantly higher than negative knowledge attribution. By contrast, if positive knowledge attribution is once again significantly higher, then that provides strong evidence that epistemic closure is not a principle of folk epistemology.

Again the results were absolutely clear. We observe the same basic pattern as last time: positive knowledge attribution was significantly higher (Figure 2). But this time higher knowledge attribution occurred in both the Inference condition (81% / 36%, binomial test, $p < .000001$) and the Perception condition (95% / 80%, binomial test, $p < .001$). Still, the difference between positive and negative attribution was much larger in the Inference condition. Rates of knowledge attribution were significantly above what could be expected by chance for positive attribution in Perception (binomial test, $p < .000001$), for negative attribution in Perception (binomial test, $p = .000001$), and for positive attribution in Inference (binomial test, $p = .000002$). By contrast, the rate of negative knowledge attribution in Inference was significantly below chance (binomial test, $p = .048$).
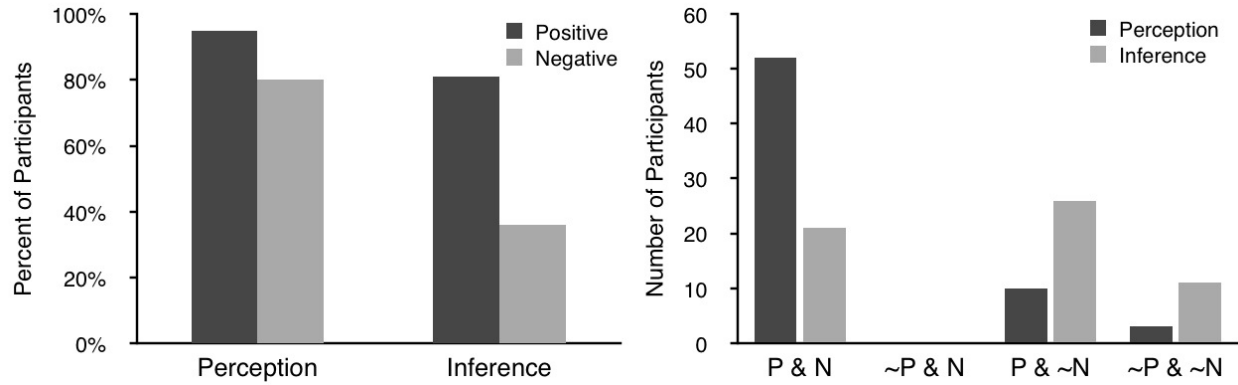
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tive language.

Fig. 2. Experiment 2. Left panel: percent of participants attributing knowledge across two source conditions with positive/negative attribution as a within-subjects factor. Right panel: number of participants in the two source conditions opting for the four possible combinations of knowledge attribution. P = positive knowledge attribution; N = negative knowledge attribution.

It is also worth examining subgroups in our sample. In particular, it is worth examining the number of people who opted for the four possible combinations of response to the two knowledge statements (Figure 2). In the Perception condition, the most common pattern was to ascribe both positive and negative knowledge (52 of 65, 80%). By contrast, in the Inference condition, the most common pattern was to ascribe positive knowledge and deny negative knowledge (26 of 58, 45%) — that is, the pattern which conflicts directly with the epistemic closure principle. The number of participants in the Inference condition who selected this combination exceeded what could be expected by chance (binomial test, $p < .001$, test proportion = .25), whereas the number who selected it in the Perception condition was trending below what could be expected by chance (10 of 68, 15%, binomial test, $p = .09$, test proportion = .25). Interestingly, in the entire study, not a single participant ascribed negative knowledge and denied positive knowledge.

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4. Experiment 3: the myth of the abominable conjunction

Many philosophers follow Keith DeRose in claiming that conjunctive assertions that suggest a violation of closure are "abominable" (DeRose 1995: 27-29; see also Schaffer 2006; Ichikawa & Steup 2012: sec. 5.1). Such conjunctions include, "She knows that she has hands, but she doesn't know that she isn't a handless brain-in-a-vat," and, "He knows that his car is still parked in the lot, but he doesn't know that his car hasn't been stolen." These have also been called "ridiculous" (Dretske 2013: 31) and "distinctly repugnant" (Sosa 2004: 41). Accordingly, it might be alleged that we should not trust the results from Experiment 2 because participants weren't forced to confront just how unacceptably counterintuitive it sounds to *agree* that Maxwell knows that his car is parked in the lot but *deny* that Maxwell knows that his car hasn't been stolen. Perhaps participants successfully "compartmentalized" their two choices, to the point where many opted for a closure-denying combination without fully grasping what they had done. The present experiment tests this conjecture by forcing participants to explicitly choose among a set of conjunctions.

4.1. Method

Participants ($N = 80$)[5] were randomly assigned to one of two conditions, Perception and Inference. The stories and procedures were exactly the same as in Experiment 1, except for two important differences. The first difference was that this time participants were instructed, "Please read the pairs of statements below and select the pair that best describes Maxwell in the story you just read." Each participant was presented with four conjunctions, corresponding to the four

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5   Thirty-one female, aged 18-70 years, mean age = 29.2 years; 93% reporting English as a native language.

possible combinations of answers to the positive and negative knowledge attributions: Positive & Negative, ~Positive & Negative, Positive & ~Negative, ~Positive & ~Negative.

[1] Maxwell knows that his car is parked in C8. And he knows that his car has not been stolen.

[2] Maxwell does not know that his car is parked in C8. But he does know that his car has not been stolen.

[3] Maxwell knows that his car is parked in C8. But he does not know that his car has not been stolen.

[4] Maxwell does not know that his car is parked in C8. And he does not know that his car has not been stolen.

The order of the four options was rotated randomly.

The second difference was that comprehension checks were not included this time, for two reasons. First, in the first two experiments, including those who had failed a comprehension check didn't change the results. Second, and more importantly, the conjunctions themselves are long and complicated and I didn't want to increase the cognitive load much beyond that of the first two experiments.

4.2. Results and discussion

If the objection considered against Experiment 2 has merit, then in this experiment very few if any participants should choose the closure-denying combination [3]. By contrast, if many participants choose combination [3], then that further undermines the claim that epistemic closure is a core commitment of folk epistemology.
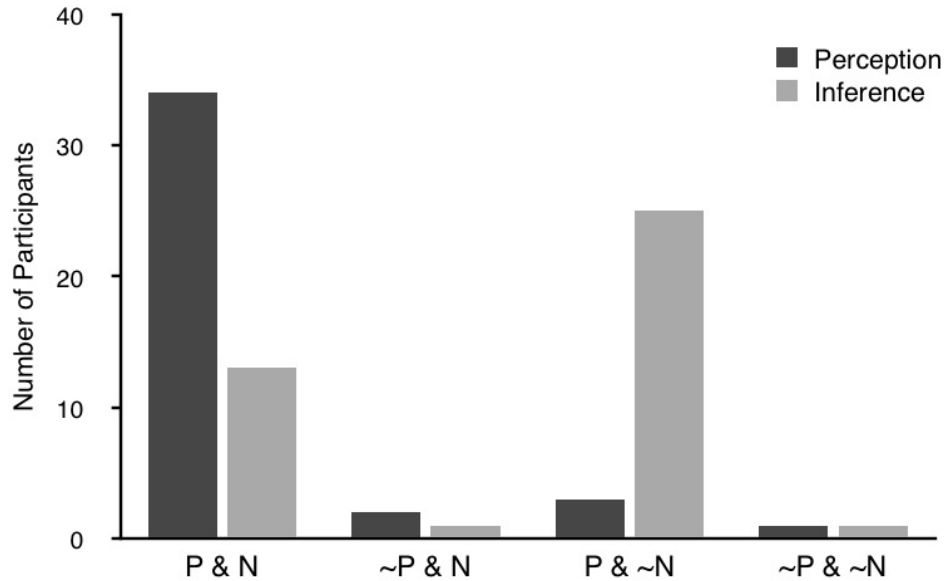
Fig. 3. Experiment 3. Number of participants in the two Source conditions who chose the different conjunctions as best describing the case. P = positive knowledge attribution; N = negative knowledge attribution.

Yet again the results were absolutely clear and cohered extremely well with our earlier observations (Figure 3). There was a significant effect of condition on which conjunction participants selected as best ($\chi^2(1, N = 80) = 27$, $p < .00001$, Cramer's V = .581). In the Perception condition, the vast majority chose option [1] (34 of 40, 85%) and very few chose the closure-denying option [3] (3 of 40, 8%). By contrast, in the Inference condition, participants chose option [1] at rates no different from what could be expected by chance (32.5%, binomial test, $p = .358$, test proportion = .25), and a shockingly large majority chose the closure-denying option [3] (25 of 40, 63%), which far exceeds what could be expected by chance (binomial test, $p < .000001$, test proportion = .25) — indeed, significantly more participants chose option [3] than chose the other three options *combined* (binomial test, $p < .000001$, test proportion = .35).

These results provide further powerful evidence that ordinary practice is not unqualifiedly committed to epistemic closure. They should also make us seriously reconsider whether the "abominable" conjunctions really are intolerable or unacceptably counterintuitive. Is the abominable *conjunction* any less mythical than the abominable *snowman*?

5.   Experiment 4: basis clarified, conditional included

At least two concerns about the earlier studies might be raised at this point.[6] First, perhaps it wasn't clear enough to participants that Maxwell believed that his car hasn't been stolen *based on* his belief (or the fact) that his car is parked in C8. This could cause us to misinterpret some responses because some participants who accept closure could still attribute positive knowledge but deny negative knowledge. In particular, they might opt for that combination because they suspect that Maxwell's negative belief is improperly based, not because they implicitly reject closure. The present experiment addresses this concern by making Maxwell's final statement more clearly express an inference. Second, some participants who accept closure might nonetheless think that Maxwell fails to know a relevant conditional, such as *if his car has been stolen, then it isn't parked in C8*. For such participants, attributing positive knowledge while denying negative knowledge shouldn't count as evidence against closure because closure requires that a relevant conditional be known. The present experiment addresses this concern by asking participants to also consider a relevant conditional knowledge attribution.

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6   Thanks to Ernest Sosa and Peter Klein for discussion on these points.

5.1. Method

Participants ($N = 153$)[7] were randomly assigned to one of two conditions, Perception and Inference. The stories and procedures were very similar to those used in Experiment 2, except for three differences. First, this time the story ends with Maxwell saying, "My car is parked in C8, so it has not been stolen." This addresses the concern that the basis of Maxwell's negative belief is unclear. Second, participants were instructed slightly differently: "At the end of the story, which things did Maxwell know? Please check all that apply."[8] Third, all participants were presented with a list of five candidate pieces of knowledge:

[1] His car is parked in C8.

[2] His car has not been stolen.

[3] If his car has been stolen, then it's not parked in C8.

[4] He is in the archives room.

[5] He is in his assistant's office.

The addition of [3] enables us to address the concern that some participants were being misinterpreted as implicitly rejecting closure. More specifically, it enables us to analyze responses from only those participants who explicitly attributed relevant conditional knowledge.

Options [4] and [5] were included to keep cognitive load closely matched across experiments. Participants checked [4] and omitted [5] 91% of the time. In light of this very high rate,

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7   Fifty-eight female, aged 18–67 years, mean age = 30.9 years; 95% reporting English as a native language.

8   Given the complexity of the conditional knowledge attribution (i.e. [3] on the list of five statements), it seemed desirable to eliminate the "Maxwell knows" from each of the separate options and instead include it in the instructions for evaluating the options.

the fact that in earlier studies excluding those who failed comprehension checks made no differ-
ence, and the fact that knowledge attributions arguably should not count as comprehension
checks, I did not exclude any participants from the analysis. Nevertheless, excluding participants
who gave the "wrong" answer to [4] or [5] does not change the pattern of results reported below.

5.2. Results and discussion

The overall results were similar to those from Experiment 2 (Figure 4), except that this time
higher positive knowledge attribution occurred only in the Inference condition (86% / 36%, bino-
mial test, $p < .000001$). In the Perception condition, positive attribution was not significantly
higher than negative attribution (92% / 86%, binomial test, $p = .084$). Positive knowledge attri-
bution was significantly above chance in Perception and Inference conditions (binomial, ps < .
000001), as was negative knowledge attribution in Perception (binomial, $p < .000001$). By con-
trast, negative attribution in Inference was significantly below chance (binomial, $p = .015$). Once
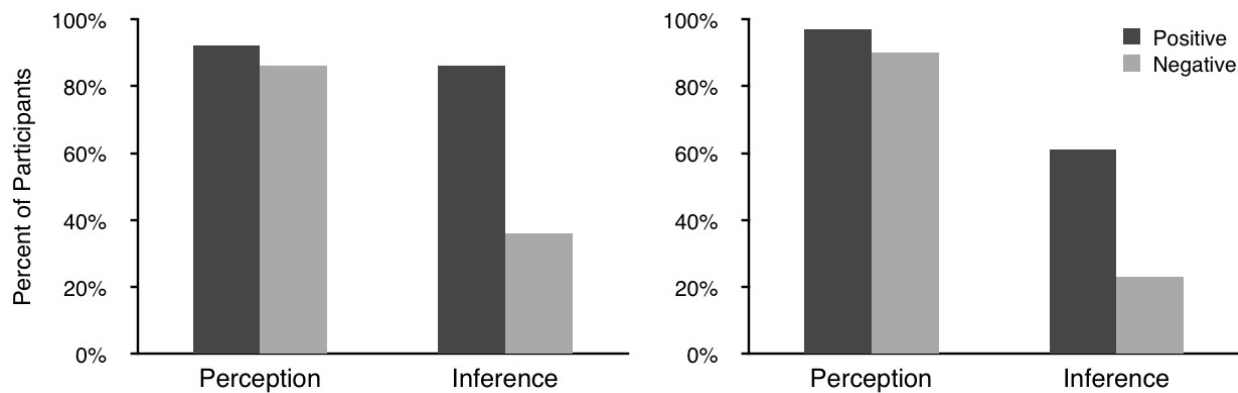again negative inferential belief was viewed differently from the other three categories.

Fig. 4. Experiment 4. Left panel: overall percent of participants attributing knowledge across the
two Source conditions with Positive/Negative attribution as a within-subjects factor. Right panel:
including data from only those participants who attributed relevant conditional knowledge.

In order to fully address the concerns outlined earlier, it's important to examine the data specifically from participants who attributed conditional knowledge to Maxwell (i.e. selected option [3]) (Figure 4). There was no effect of condition on whether participants attributed conditional knowledge (Perception/Inference: 39% / 41%, Fisher's exact test, $p = .870$) and overall participants attributed conditional knowledge at rates below chance (40%, binomial, $p = .015$).[9] Including data from *only* participants who attributed conditional knowledge, we're left with respectable sample sizes of 31 for Inference and 30 for Perception. Once again, in this more restricted sample, positive attribution was significantly higher than negative attribution in the Inference condition (61% / 23%, binomial test, $p = .00001$), whereas positive attribution was not significantly higher in the Perception condition (97% / 90%, binomial, $p = .368$). Positive and negative attribution exceeded chance in the Perception condition (binomials, ps $< .000001$). In the inference condition, negative knowledge attribution was significantly below chance (binomial, $p = .003$), whereas positive attribution was non-significantly above chance (binomial, $p = .$

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9   This might come as a surprise to some readers, though perhaps it shouldn't because the conditional is more complex and effortful to comprehend. In the present case, this is compounded by two further facts: (i) the conditional has an affirmative antecedent and a negative consequent, which can inhibit fluent processing, and (ii) the conditional is embedded in a mental state attribution, which further complicates matters. Furthermore, the pragmatics of conditionals might have played a further role in this. For instance, as anyone who has taught introductory logic knows, people sometimes interpret a conditional as asserting or implying *both* the antecedent *and* the consequent — i.e. the *conjunctive* interpretation. The vast majority of participants (87%) said Maxwell knows that his car is parked in C8, (binomial, $p < .000001$, test proportion $= .5$). At least some of those participants might have interpreted the conditional conjunctively, in which case they would naturally deny that Maxwell knows the conditional, because they think the "right conjunct" (i.e. the consequent) is false.

281).

Examining subgroups in our sample again reveals a picture very similar to Experiment 2. In the Perception condition, the most common pattern by far was to ascribe both positive and negative knowledge (62 of 77, 80%), which exceeds what could be expected by chance (binomial test, $p < .000001$, test proportion = .25). By contrast, in the Inference condition, the most common pattern was to ascribe positive knowledge and deny negative knowledge (36 of 76, 47%), which exceeds what could be expected by chance (binomial, $p = .00001$, test proportion = .25). Focusing specifically on only those who attributed conditional knowledge, the same combinations were again most frequently selected in both Perception (27 of 30, 90%) and Inference (12 of 31, 39%). Whereas in Experiment 2 not a single participant ascribed negative and denied positive knowledge, this time a very small fraction of participants selected this combination (5 of 153, 3%).

6. Experiment 5: conceptual replication

The results thus far have painted a nuanced and consistent picture that seriously undermines the persistent claims of epistemic closure's proponents. But all the studies used the same basic "car theft" story. This is good in some respects. For example, given that we used the same story in both Experiment 1 and Experiment 2, if we found a closure-violating asymmetry in the first but not the second experiment, then we could have attributed that to the difference between a be-tween-subjects and a within-subjects comparison. And closure's proponents might have found some solace in that asymmetry. However, using the same story is not good in all respects. For in-stance, it might be suggested that all the results are somehow an artifact of this particular story.

While I doubt that this suggestion is correct, it's nevertheless true that it would strengthen the main findings if we observed the same basic pattern using a different cover story. The present experiment pursues this question. Having observed the same basic patterns over the first four experiments, I'll limit the replication to the basic between-subjects design from Experiment 1.

6.1. Method

Participants ($N = 160$)[10] were randomly assigned to one of four conditions in a 2 (Source: Perception, Inference) × 2 (Content: Positive, Negative) between-subjects design, which exactly mirrored the design from Experiment 1. Participants in each condition read a single story. This time the story was about an office worker who sets her computer to work and then walks across the hall into her assistant's office. The Source factor manipulated source of belief. The Content factor manipulated which of two statements participants were asked (Positive: the computer is analyzing data; Negative: hackers have not crashed the computer). Here is the story, with the difference between Perception and Inference conditions bracketed and separated by a slash:

> (Perception/Inference) When Mrs. Palmer arrives at work in the morning, she always starts her computer and puts it to work analyzing data sets. Today she she put her computer to work analyzing demographic data and then walked into her assistant's office across the hall. ¶ Palmer says to her assistant, "It might take the computer a while to analyze the demographic data." The assistant asks, "Mrs. Palmer, is your computer analyzing the data? It's not unheard of for computer hackers to attack the system and crash a computer." ¶ Mrs. Palmer [looks carefully through the window into her office / thinks care-

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10 Fifty-six female, aged 18–62 years, mean age = 29.5 years; 96% reporting English as a native language.

fully for a moment about the matter] and then responds, "No, the hackers have not crashed it. The computer is analyzing data."

This "computer crash" story closely matches the earlier "car theft" story in terms of length and complexity.

After reading the story, participants were instructed, "Please read the statements below and check all that are true in the story you just read." Each participant was presented with three statements. Participants in all conditions received statements [2] and [3]; participants in Positive conditions also received statement [1P]; participants in Negative conditions also received statement [1N].

[1P] Palmer knows that the computer is analyzing data.

[1N] Palmer knows that hackers have not crashed the computer.

[2] Palmer is in the archives room.

[3] Palmer is in her assistant's office.

The order of the statements was rotated randomly. I will interpret participant response to the knowledge statement the same way as in Experiments 1 and 2 (i.e. in terms of attributing positive and negative knowledge).

Seventeen participants who either omitted option [3] or selected option [2] were excluded from the analysis, on the grounds that they were not reading the story carefully enough. Including data from these participants didn't affect the results reported below.

6.2. Results and discussion

The results replicated our earlier findings: participants ascribed positive knowledge significantly more frequently (Figure 5). But, again, higher positive attribution occurred only in the Inference

condition (81% / 50%, Fisher's exact test, $p = .005$, Cramer's V = .320). In the Perception condition, rates of negative attribution were slightly higher, though the difference was not significant (92% / 87%, Fisher's exact test, $p = .481$, n.s.). Rate of knowledge attribution in the Positive Inference condition didn't differ significantly from rates in either the Positive Perception (Fisher's exact test, $p = .765$) or Negative Perception conditions (Fisher's exact test, $p = .331$). Once again it was the Negative Inference condition that differed from the other three.[11]
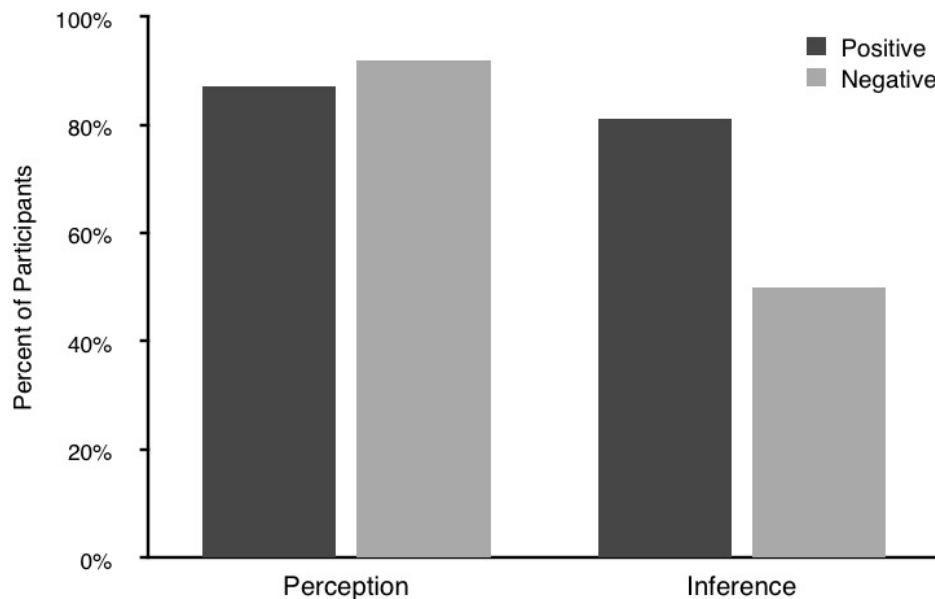

Fig. 5. Experiment 5. Percent of participants attributing knowledge.

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[11] In a logistic regression model that included Source, Content, and the interaction term Source*Content as predictors and knowledge *denial* as the outcome, only the interaction Source*Content significantly predicted knowledge denial, recording an odds ratio of 7.5. This means that when changing the content of Maxwell's belief from positive to negative, the odds of denying knowledge increased 7.5 times more for inferential belief than for perceptual belief. See Appendix B. (Compare the results reported in Turri 2014.)

7. Conclusion: experiment as stereoscope

For decades debate has raged over the epistemic closure principle. On one side, Dretske, Nozick and others argue that there are good theoretical arguments for rejecting the epistemic closure principle and that there are compelling counterexamples to it. On the other side, Stroud, Vogel, Hawthorne and others argue that the epistemic closure principle is a defining feature of ordinary thought and talk about knowledge. Some have gone so far as to claim that denying closure is only slightly less absurd than "denying the transitivity of the *taller than* relation" (Hawthorne 2004: 38).

But the results from our five experiments paint a very different image of the status of epistemic closure in folk epistemology. The overall pattern of results is definitely not what closure's proponents had led us to expect. We repeatedly observed patterns that are hard to reconcile with the claim that (unqualified) epistemic closure is a defining feature of folk epistemology. We observed similar results using between-subjects and within-subjects designs, when questioning participants in different ways, and when using different cover stories. Participants responded in the same basic way even when it required them to provide purportedly "abominable" or "repugnant" answers. But this happened primarily only when the protagonist relied on inference rather than observation, a pattern observed in all five experiments. In Experiment 3, participants overwhelmingly selected closure-friendly conjunctions in the perception condition, but a surprisingly large majority in the inference condition selected the supposedly "abominable" closure-denying conjunction. In Experiments 1 and 5, negative attribution was slightly but non-significantly higher in the perception condition, in Experiment 4 positive attribution was slightly but non-significantly higher, and in Experiment 2 positive attribution was higher. Overall, it's possible that these slight

differences in positive/negative attributions in perception conditions resulted from random vari-ation, and the population is disposed to attribute positive and negative perceptual knowledge at basically the same rate. However, the same cannot be said for the positive/negative asymmetry in inference conditions.

Overall, then, ordinary practice does not endorse an unqualified version of the epistemic closure principle. But it's arguably consistent with our results that ordinary practice is committed to a *source-relative* version of the epistemic closure principle. In particular, it's consistent with our results that a *perceptual epistemic closure principle* is a defining feature of folk epistemol-ogy. This is ironic given that the most famous attempted counterexamples feature perceptually based beliefs (e.g. Dretske's zebra case).

Despite the irony, these results fit well with the results from recent research on knowledge attributions. Studies have repeatedly shown that when the agent has, or has had, *perceptual ac-cess* to the truth of what she believes, it significantly increases the rate at which people ascribe knowledge to her, even in cases which philosophers claim are obviously not instances of knowl-edge, such as Gettier cases (Starmans & Friedman 2012; Turri 2013b; Nagel, San Juan & Mar 2013; Turri, Buckwalter & Blouw 2014; for an overview, see Turri in press). I suspect that this growing body of research points to something very important about the way we ordinarily think of experience and its relationship to knowledge — about perception's epistemic profile in the manifest image. It's probably no accident that Hume's discussion of "skeptical doubts" began only with matters of fact that go "beyond the present testimony of our senses" (Hume 1748: §4.1), or that Moore's famous proof featured readily perceptible extremities (Moore 1959: 144), or that even 3-year olds assign perceptual access considerable weight when deciding whether

other people know (Pillow 1989).

Our results have implications for the many debates in contemporary epistemology where proponents of epistemic closure wrap themselves in the mantle of commonsense and ordinary practice. These include debates over skepticism and the semantics and pragmatics of knowledge attributions. If the unqualified (i.e. non-source-relative) epistemic closure principle is not a defining feature of folk epistemology, then theories that "abandon" it are not revisionary. Rejecting the principle doesn't conflict with ordinary practice or commonsense. In light of our results, accusations of abandonment and revisionism ring decidedly hollow. Instead, a theory of knowledge that rejects the unqualified principle thereby gains the *advantage* of being consistent with ordinary practice on this score, and perhaps even the considerable advantage of being able to charitably explain our overall pattern of knowledge judgments.

One explanation of our results is that what philosophers mean by epistemic closure — *philosophers' closure* — is too subtle or complicated for ordinary people to understand, which is why they exhibit patterns that violate it.[12] I have four responses to this explanation. First, and most importantly, if it's correct, then the principle is admittedly not a defining feature of folk epistemology and, by extension, abandoning it is not revisionary, in which case a serious reevaluation of several core debates in contemporary epistemology is in order. Second, the explanation might be unduly pessimistic about the sophistication of folk epistemology. For instance, ordinary people are remarkably sensitive to the complex factors that undermine knowledge in Gettier cases (Turri, Buckwalter & Blouw 2014), which are at least as subtle and complicated as the epistemic closure principle. Third, the explanation doesn't account for why people seem to respect

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[12]   Thanks to Ernest Sosa for suggesting this explanation, without necessarily endorsing it.

closure in perceptual cases but not in inferential cases. Fourth, if people responded consistently with closure across all the sources of knowledge, then that would support the view that they implicitly understand and accept an unqualified closure principle. By the same token, if people respond consistently with closure for some but not all sources of knowledge, then that supports the view that people implicitly understand and accept closure for some sources but not for others.

Of course, there might still be good theoretical arguments favoring the unqualified closure principle. Rather than relying on what are, at the very least, problematic *descriptive* claims about ordinary practice, closure's proponents could pursue a *prescriptive* strategy: make the argument that we *ought* to think of knowledge that way. To continue with a Sellarsian thought quoted earlier, closure's proponents can rightfully point out that "there is truth and error with respect to the [manifest image], *even though the image itself might have to be rejected, in the last analysis, as false*" (Sellars 1963: 14). Alternatively, they could adopt a more nuanced approach by seriously entertaining the possibility that the doors to knowledge are many, some of which always close when you pass through, others of which often remain open.

Finally, our results also suggest an explanation for the persistent controversy over the epistemic closure principle in contemporary epistemology. Sellars suggested that not only does philosophy aim for an accurate picture of the manifest image, but that the image is both immanent in and transcendent of individual philosophical reflection, simultaneously infusing it and at least partly eluding it. If the doors to knowledge are some open and some closed, and this fact is reflected in our "pre-reflective orientation" and "heritage" (i.e. part of folk epistemology), then it's possible that each side of the debate had grasped part of the truth while failing to grasp that its grasp is only partial. Each side intuitively glimpsed part of the image (the image immanent)

but mistook it for the whole (the image transcendent). If that explanation is on the right track, then our present investigation has handsomely repaid the effort. Through the use of careful and theoretically informed experimentation, we have taken "two differing perspectives on a landscape" and, in good stereoscopic fashion, "fused them into one coherent experience" (Sellars 1963: 4-5).

Appendix A

I performed a binary logistic regression to assess the impact of Source and Content on the likeli-hood that participants would deny knowledge in Experiment 1. The model contained Source, Content, and the interaction of Source and Content as predictor variables and knowledge denial as the outcome variable. The full model was statistically significant, $\chi^2(3, N = 145) = 38, p < .000001$ (see Table 1). It explained between 23.1% and 35.7% of the variance in knowledge denial, and it correctly classified 83% of cases. Neither Source nor Content of belief made a unique statistically significant contribution to the model. There was a significant interaction between the Source and Content of belief, which recorded an odds ratio of 37.62. This indicates that by changing the content of the protagonist's belief from positive to negative, the odds of denying knowledge increased over 37 times more for inferential belief than for perceptual belief.

Table 1. Experiment 1: logistic regression predicting knowledge denial. Reference class for Source: Perception. Reference class for Content: Positive.

	B	S.E.	Wald	df	p	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
Source	-0.45	0.81	0.31	1	.579	0.64	0.13	3.01
Content	-0.88	0.90	0.96	1	.328	0.41	0.07	2.43
Source*Content	3.63	1.13	10.25	1	.001	37.62	4.08	346.67
Constant	-1.98	0.53	13.80	1	<.001	0.138		

Appendix B

I performed a binary logistic regression to assess the impact of Source and Content on the likeli-hood that participants would deny knowledge in Experiment 5. The model contained Source, Content, and the interaction of Source and Content as predictor variables and knowledge denial as the outcome variable. The full model was statistically significant, $\chi^2(3, N = 160) = 23.61, p < .0001$ (see Table 2). It explained between 13.7% and 20.8% of the variance in knowledge denial, and it correctly classified 77% of cases. Neither Source nor Content of belief made a unique stat-istically significant contribution to the model. There was a significant interaction between the Source and Content of belief, which recorded an odds ratio of 7.5. This indicates that by chan-ging the content of the protagonist's belief from positive to negative, the odds of denying know-ledge increased 7.5 times more for inferential belief than for perceptual belief.

Table 2. Experiment 5: logistic regression predicting knowledge denial. Reference class for Source: Perception. Reference class for Content: Positive.

	B	S.E.	Wald	df	p	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
Source	0.47	0.62	0.57	1	.449	1.6	.47	5.40
Content	-0.60	0.77	0.60	1	.437	0.55	0.12	2.48
Source*Content	2.02	0.92	4.82	1	.028	7.5	1.24	45.3
Constant	-1.89	0.48	15.46	1	<.001	0.152		

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