The epistemology of absence-based inference

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Abstract. Our main aim in this paper is to contribute towards a better understanding of the epistemology of absence-based inferences. Many absence-based inferences are classified as fallacies. There are exceptions, however. We investigate what features make absence-based inferences epistemically good or reliable. In Section 2 we present Sanford Goldberg's account of the reliability of absence-based inference, introducing the central notion of epistemic coverage. In Section 3 we approach the idea of epistemic coverage through a comparison of alethic and evidential principles. The Equivalence Schema—a well-known alethic principle—says that it is true that *p* if and only if *p*. We take epistemic coverage to underwrite a suitably qualified evidential analogue of the Equivalence Schema: for a high proportion of values of *p*, subject *S* has evidence that *p* due to her reliance on source *S** if and only if *p*. We show how this evidential version of the Equivalence Schema suffices for the reliability of certain absence-based inferences. Section 4 is dedicated to exploring consequences of the Evidential Equivalence Schema. The slogan 'absence of evidence is evidence of absence' has received a lot of bad press. More elaborately, what has received a lot of bad press is something like the following idea: absence of evidence sufficiently good to justify belief in *p* is evidence sufficiently good to justify belief in ~*p*. A striking consequence of the Evidential Equivalence Schema is that absence of evidence sufficiently good to justify belief in *p is* evidence sufficiently good to justify belief in ~*p*. We establish this claim in Section 4 and show how this supports the reliability of an additional type of absence-based inference. Section 4 immediately raises the following question: how can we make philosophically good sense of the idea that absence of evidence is evidence of absence? We address this question in Section 5. Section 6 contains some summary remarks.

Keywords: fallacy of ignorance; epistemic coverage; absence-based inference; absence-based belief; Sanford Goldberg; alethic principles; evidential principles; absence of evidence, evidence of absence; reliabilism.

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1. Absence-based inference

Statements such as 'Junyeol doesn't know that there are deer in this forest' and 'There's no evidence that extraterrestrials do not exist' concern *epistemic absences*. The first statement says of Junyeol that he *lacks* knowledge, the second that there is an *absence* of evidence. Let us use the label 'absence-based inference' to denote inference involving epistemic absence.

The term 'fallacy of ignorance' is used to denote certain fallacious, absence-based inferences that go from a premise concerning an epistemic absence with respect to p to the conclusion that $\sim p$. (Or: substituting $\sim q$ for p, from a premise concerning an epistemic absence with respect to $\sim q$ to the conclusion that q).

Consider a few examples of inferences of this form:

(DEER) I don't know that there are deer in this forest.
So, it's not the case that there are deer in this forest.

(EXTRA) There's no conclusive evidence that extraterrestrials do not exist.
So, extraterrestrials exist.

Suppose that Junyeol is walking through a forest with which he is not familiar. Having failed to spot any deer he reasons along the lines of (DEER). Or suppose that Junyeol is contemplating the question whether there is extraterrestrial life and reasons along the lines of (EXTRA). In both cases Junyeol commits a fallacy of ignorance. The epistemic absence mentioned in the premise does not make likely the truth of the conclusion. There may well be deer in the forest though Junyeol has not directly perceived any or observed anything that puts him in a position to know that they are present. Likewise it may well be the case that there are no extraterrestrials although there is no conclusive evidence that this is so. For this reason, considered as inferences, (DEER) and (EXTRA) are flawed. *Mutatis mutandis* in the epistemic domain: considered as vehicles for acquiring beliefs with a positive epistemic standing (DEER) and (EXTRA) are flawed. Operating within a broadly reliabilist framework—as we do in the present paper—this amounts to saying that the process of forming beliefs via the kind of inference exemplified by (DEER) and (EXTRA) fails to be (conditionally) reliable.

The focus of this paper is the epistemology of absence-based inferences. To fix our target phenomenon consider the following four examples of absence-based inference:

(COMMON ROOM)
Yvonne is having her lunch in the departmental common room and is joined by her colleague Natalie. Yvonne, who has impeccable eyesight, had a good look around to see if John was there when she arrived but she failed to spot anyone else. Yvonne knows both John and the layout of the room well. When asked by Natalie whether John is in the common room, she replies: 'no, for if he were here I would have seen him'.

(ASSASSINATION)
Freya has been watching BBC News without interruption for the past 4 hours. She has learnt that this news channel is highly reliable when it comes to British politics, and she knows they haven't reported that the Prime Minister has been assassinated. When queried whether the Prime Minister has recently been assassinated, she replies: 'no, for if that were true I would have heard about it by now'.

(TORRES)
Crispin is an avid Liverpool supporter. He has followed the team closely for many years, paying careful attention to league standings and team statistics every season. Crispin is well aware of his obsession with the club. During a conversation with Philip, the question arises whether Fernando Torres scored more than 25 league goals in his first season at Liverpool. Having thought hard for a minute and not having any recollection of this being so, Crispin concludes that Torres didn't score more than 25 league goals that season. He reasons: 'if that were so, I would have recalled.'

(COMMUNIST)
A serious FBI investigation, including a thorough and professional search of Mr X's background, fails to unearth any evidence at all that Mr X is a communist. At a press conference an FBI spokesperson is asked whether Mr X is a communist. Knowing the outcome of the investigation and being aware of the extensive resources at the FBI's disposal, the spokesperson answers: 'no, for if Mr X were a communist, we would have found evidence to that effect'.[1]

Each of the above cases features an absence-based inference. What is characteristic of the four examples just given is that a subject infers $\sim p$ from the absence of evidence that p. It is easy to multiply cases.

Bearing in mind (DEER) and (EXTRA) it might be tempting to think that all absence-based inferences are epistemically bad. However, our contention is that (COMMON ROOM), (ASSASSINATION), (TORRES), (COMMUNIST), and cases relevantly similar feature absence-based inferences that are epistemically good. Taking our cue from Goldberg (2010a, 2010b, 2011) we argue that absence-based inference is reliable in these cases. Goldberg suggests that absence-based inference makes for a reliable belief-forming process provided that the subject enjoys so-called *epistemic coverage* (and

[1] The FBI example is from Copi (1953: 56). See also Walton (1999).

the subject is receptive to evidence transmitted to her). Roughly speaking, a subject enjoys epistemic coverage with respect to a given domain if she is connected to a source that reliably feeds her information about the domain.[2] This seems to be the case in each of (COMMON ROOM), (ASSASSINATION), (TORRES), and (COMMUNIST). Now, Goldberg focuses specifically on testimony and memory. However, reflecting on (COMMON ROOM), (ASSASSINATION), (TORRES), and (COMMUNIST) suggests that epistemic coverage applies more generally. These cases involve a multitude of capacities or sources. (COMMON ROOM) is a perceptual case. Yvonne relies on visual perception for information. (ASSASSINATION) is a testimonial case. Freya relies on the BBC for information. (TORRES) is a memory case. Crispin relies on memory for information. (COMMUNIST) is a mixed case where the members of an investigation unit rely on a range of different capacities and sources.

Our main aim in this paper is to understand better the epistemology of absence-based inferences. In particular, we are interested in accounting for the epistemic goodness of (COMMON ROOM), (ASSASSINATION), (TORRES), (COMMUNIST), and like cases. We use Goldberg's insightful proposal as a starting point, but hope to add some new ideas and elaborate on the proposal in significant ways. The plan of the paper is as follows: in Section 2, following Goldberg, we present a rationalized version of a certain type of absence-based inferences and unpack the notion of epistemic coverage, together with a number of accompanying notions. We frame our presentation explicitly in terms of evidence. Goldberg does not do so, but this approach strikes us as natural and we rely on it later. In Section 3 we approach the idea of epistemic coverage through a comparison of alethic and evidential principles. The Equivalence Schema—a well-known alethic principle—says that it is true that p if and only if p. We take epistemic coverage to underwrite a suitably qualified evidential analogue of the Equivalence Schema: for a high proportion of values of p, subject S has evidence that p due to her reliance on source S^* if and only if p. On the basis of this schema we support the reliability of the type of absence-based inferences that Goldberg is interested in. Section 4 is dedicated to exploring consequences of the Evidential Equivalence Schema. The slogan 'absence of evidence is evidence of

[2] In saying that we take our cue from Goldberg we do not mean to suggest that he is the first to deny that all absence-based inferences are bad. It is widely acknowledged that some such inferences do not qualify as fallacies—indeed, this is often pointed out in logic textbooks (see, e.g., the treatment of fallacies in Copi (1953) and Hurley (2011)). However, to our knowledge, Goldberg is the first to offer a systematic and distinctively epistemological account of absence-based inferences.

absence' has received a lot of bad press. More elaborately, what has received a lot of bad press is something like the following idea: absence of evidence sufficiently good to justify belief in *p* is evidence sufficiently good to justify belief in ~*p*. A striking consequence of the Evidential Equivalence Schema is that this idea holds good. We establish this claim in Section 4 and show how this supports the reliability of an additional type of absence-based inference. Section 4 immediately raises the following question: how can we make philosophically good sense of the idea that absence of evidence amounts to evidence of absence? We address this question in Section 5. Section 6 contains some summary remarks.

2. Epistemic coverage and absence-based belief

We have presented (COMMON ROOM), (ASSASSINATION), (TORRES), and (COMMUNIST) as cases involving epistemically good absence-based inference. In this section we do three things. First, we say something about what kind of epistemic absence is involved in the target cases. Second, we spell out the form or structure of the kind of absence-based inferences that Goldberg discusses. Third, we introduce epistemic coverage in some detail. Epistemic coverage is what Goldberg appeals to in order to account for the epistemic goodness of the relevant type of absence-based inferences.

Let us turn to the first task—the task of saying something about how to think about epistemic absence in the cases we are interested in. Here is what we have to say: it is natural to think of the relevant range of cases in terms of absence of evidence. In (COMMON ROOM) Yvonne's perceptual capacities do not provide any evidence that John is present. In (ASSASSINATION), after watching the BBC for several hours, Freya is left with no evidence that the Prime Minister has been assassinated. In (TORRES), having exercised his memory, Crispin has no recollection—or memory-based evidence—that Torres scored more than 25 league goals in his first season at Liverpool. Lastly, in (COMMUNIST), the investigation carried out by the FBI yields no results, and so, the spokesperson possesses no evidence that Mr X is a communist.[3]

[3] Let us make a couple of remarks. First, although evidential absences strike us as a natural choice for our discussion, we grant that our target cases may well instantiate or exemplify other kinds of epistemic absences as well. For example, if you think that evidence is necessary for justification, evidential absences bring with them justificatory absences. If, in addition, you think that justification is necessary for knowledge, evidential absences bring with them two types of epistemic absences. Second, we are assuming that all four cases can be treated as involving evidence. Some people will deny this.

We now turn to the second task, the task of specifying the form or structure of the type of absence-based inference in our target cases. This is the type of cases that Goldberg is interested in (although, as noted earlier, he focuses mainly on testimony and memory, i.e. cases like (ASSASSINATION) and (TORRES)).

The end of the description of each of the target cases points us to the following conditional (where *S* is the subject who carries out the inference):

(1) If *p* were the case, *S* would possess evidence that *p*.

The conditional in (1) is sustained by the epistemic coverage enjoyed by *S* for the relevant domain—that is, roughly, by *S*'s being evidentially hooked in. Thus, in (COMMON ROOM), had John been present, Yvonne would have possessed evidence to that effect—she would simply have seen him.

Following Goldberg (2010b, Section 2.2) we take the reasoning involved in epistemically good cases of absence-based inference to proceed on the basis of a consequence of (1):

(2) If it is not the case that *S* has evidence that *p*, then ~*p*.

(2) works in conjunction with the kind of evidential absence noted earlier, resulting in the following inference:

(2) If it is not the case that *S* has evidence that *p*, then ~*p*.
(3) It is not the case that *S* has evidence that *p*.
(4) So, ~*p*.

To connect this to one of our four examples, the inference we get for (COMMON ROOM) is as follows (where 'I' picks out Yvonne):

(2.CR) If it is not the case that I have evidence that John is in the common room, then it is not the case that John is the common room.
(3.CR) It is not the case that I have evidence that John is in the common room.
(4.CR) So, it is not the case that John is in the common room.

Let us use 'absence-based belief' to refer to belief based on epistemic absence. Belief in the conclusion of an absence-based inference qualifies as absence-based belief in this sense. Looking at (2.CR)-(4.CR) we can thus say that Yvonne has an absence-based belief to the effect that John is not in the common room. Goldberg's claim is, roughly, that absence-based belief enjoys a good epistemic standing provided that the relevant absence-based inference pertains to a domain for which the subject enjoys epistemic coverage. We agree.[4]

Two comments before we go into detail with the crucial notion of epistemic coverage. First, recall that by labeling absence-based inferences 'epistemically good' we mean to say that they are reliable. Goldberg operates within a reliabilist framework, and we follow him in this regard. Second, we discuss absence-based inferences explicitly in terms of evidence. Goldberg does not do so, but in some places evidence is very much a background or side theme (see, e.g., (2010b: 251)). Furthermore, as suggested earlier, it seems quite natural to think of the epistemic absences involved in the kinds of cases of interest to Goldberg and us in terms of evidence. Framing the discussion in this way also puts us in a position to see that there is an intimate connection between absence-based inferences, epistemic coverage, and the issue when—if ever—absence of evidence sufficiently good to justify belief is evidence sufficiently good to justify belief in absence.

According to Goldberg, epistemic coverage is a crucial component of what sustains (2). He presents three conditions that are meant to be jointly sufficient for a subject to enjoy epistemic coverage for a given domain. With some adjustment and reformulation we collapse his three conditions into one complex condition. We use the label 'Epistemic Coverage Condition' to denote the resulting condition.

The Epistemic Coverage Condition says that

(ECC) At a given time t, source S^* provides epistemic coverage for subject S within domain D just in case:

(i) S^* reliably tracks p-relevant evidence and reliably determines whether p on that basis (for p that S takes an interest in and pertains to D),

[4] Strictly speaking, according to Goldberg, two further conditions must be met. Again, we agree. We present the two additional conditions in detail below.

(ii) S^* is reliable in making *p*-relevant evidence available to *S*, and

(iii) if relevant *p*-evidence were to be available, S^* would track it and make it available to *S* by the time at which *S* relied on S^*.[5]

What sorts of sources provide coverage varies from domain to domain. In (COMMON ROOM), the subject—Yvonne—enjoys epistemic coverage for what goes on in the departmental common room through visual perception. Yvonne's visual capacities reliably track evidence about her immediate surroundings and reliably determine on that basis what is going on in the common room. Since the operative processes involve swift and automatic processessing and transitions, the time at which the source tracks a given piece of data and determines whether or not something is the case on that basis typically immediately precedes the time at which that same piece of data is made available to the subject. That is, (COMMON ROOM) is a case in which the satisfaction of (i) and the satisfaction of (ii) follow in immediate succession. Condition (iii) is also satisfied in (COMMON ROOM). At the time Yvonne relies on her visual capacities for information about whether John is in the common room, these capacities would have made relevant evidence available to her, were such evidence to be available.

Let us now note a difference between (COMMON ROOM) and (ASSASSINATION). While both cases satisfy (ECC), they do so in ways that are significantly different. In (COMMON ROOM) the source on which Yvonne relies is integrated into her own cognitive system. She relies on an internal source. However, in (ASSASSINATION) Freya relies on an external source—BBC News—for information about the Prime Minister. What is more, Freya's reliance has a social character: BBC News is a complex, external source whose functioning is fundamentally due to other subjects. Freya is thus relying on others for information.

A further difference: while a major news corporation like BBC reliably tracks information about the Prime Minister and is reliable in determining the truth-value of statements of extremely high news value such as 'The Prime Minister has been assassinated', it takes some time to make news items available to the wider public.

[5] Note that Goldberg (2010a) speaks in terms of the relied-upon source *investigating*, *reporting*, and *communicating*. This manner of speaking naturally carries the suggestion that the source possesses agency. In the context of Goldberg (2010a) this makes good sense since the main focus is on our reliance on others as testifiers. However, it makes for a less natural fit when we focus on sources such as vision or other perceptual capacities. In light of this we have formulated (ECC) in terms of tracking (rather than investigating) whether *p* and making *p*-relevant evidence available (rather than reporting and communicating findings of investigations).

After all, such items have to appear in print or online, or be presented on tv or radio. For this reason the satisfaction of condition (ii) of (ECC) does not immediately succeed the satisfaction of (i)—or, in any case, not as immediately as in (COMMON ROOM).

How about (iii)—does BBC News satisfy (i) and (ii) in a timely fashion? Yes. Freya has been watching BBC News for four hours when she wonders whether the Prime Minister has been assassinated. At that time, were any relevant evidence to be available, BBC News would have tracked it and made it available to her.[6]

Let us note three things about (iii). First, Goldberg calls it the 'sufficient interval condition' (2010a: 161)—the rationale behind this choice of label being that the condition is meant to ensure that sufficient time has passed for the source to track evidence pertaining to the relevant matter or issue and make it available to the subject. This condition explains why a subject fails to enjoy epistemic coverage in cases where she forms a belief that $\sim p$ before the relied-upon source has finished surveying the relevant domain. In that case not enough time has passed for the source to track p-relevant evidence and make it available to the subject.

Second, as Goldberg himself observes (2010a: 161–162), it makes sense to relativize the sufficient interval condition in two respects: the nature of p and the nature of the source S^*. For example, on the assumption that the cafeteria is much bigger than the departmental common room, what counts as a sufficient interval vis-à-vis 'John is in the cafeteria' and 'John is in the common room' is likely to vary because it will take Yvonne's visual capacities longer to scan the cafeteria than the departmental common room. What counts as a sufficient interval for respectively 'The Prime Minister has been assassinated' and 'The Prime Minister had afternoon tea at the Tate' may likewise vary because the former possesses far greater news value than the latter, and so, can reasonably be expected to be tracked and made available as a news item faster than the latter. These variations we get by keeping the source fixed and considering different target propositions. However, we also get variations if we

[6] See Gelfert (forthcoming) for an interesting and in-depth discussion of timeliness. Gelfert proposes what he calls 'epistemic penetration' as a necessary condition for the epistemic goodness of absence-based beliefs. What epistemic penetration amounts to is this: relevant evidence must be diffused beyond the source that initially tracks it. Sometimes only one source is involved. However, other times evidence passes through a chain of sources. For instance, a global news agency relies on its reporters in the field for information. In turn, global agencies are often relied on by national agencies for coverage of certain types of news. We agree that this kind of diffusion—or epistemic penetration—is necessary. Indeed, our agreement comes out when two observations are made: first, (ECC) is a necessary condition for the epistemic goodness of absence-based belief, and second, condition (iii) of (ECC) implies epistemic penetration in Gelfert's sense. Putting these two observations together we get that epistemic penetration is required for the epistemic goodness of absence-based belief.

keep the target proposition fixed and consider different sources. Compare, e.g., a small local newspaper and a major newscorporation like BBC News. Both of these may reliably track and make announcements concerning certain issues. However, due to its vast advantage in terms of manpower and resources, BBC News can reasonably be expected to make these announcements faster than the local newspaper. In turn, this means that, if a subject relies on the local newspaper for information on the issue whether *p*, the interval needed to satisfy (iii) may well be longer than if the subject were to rely on BBC News instead.

Third, whether condition (iii) is satisfied may depend on contingencies specific to the time at which a certain source is relied upon for information. Goldberg (2010a: 163–164) provides a nice illustration of this with an example along the following lines: suppose that Jihey depends on a local newspaper for information about developments in local educational policies, and that she is wondering if any such developments have occurred within the last couple of weeks. We can suppose that the local paper is extremely reliable in tracking changes in local educational policies and are prompt in reporting them. However, imagine that the reporter who is responsible for covering local news in the educational sector has been on vacation for the last couple of weeks and no replacement has been brought in. In the absence of news items reporting changes in local educational policies Jihey forms the absence-based belief that no such changes have occurred. However, in this case her belief does not enjoy a good epistemic standing. This is because condition (iii) of (ECC) fails to be satisfied: in the absence of the reporter, the local paper would not have made relevant evidence available to Jihey, had such evidence been available.

Now, satisfaction of (ECC) is not by itself enough to sustain—or make epistemically good—the conditional premise of absence-based inference (i.e. (2): if *S* does not possess evidence that *p*, then ~*p*). In addition to enjoying epistemic coverage, the subject must be receptive to information transmitted by the source that provides the coverage. To see this, suppose that the subject was not receptive in this way. In that case *S*'s not possessing any evidence that *p* should not support ~*p*. For, it may be that the source had made available very strong evidence that *p*, but that *S* had simply failed to register it. To deal with this kind of issue Goldberg introduces what we call the 'Receptivity Condition'. It reads as follows:

(RC) If *p*-relevant evidence were to be made available by source *S** on which the subject *S* is relying, then *S* would register it. (Here *S** is a source that provides epistemic coverage for *S* relative to *p*'s domain.)

(RC) is satisfied in our four cases. In (COMMON ROOM), if John was to be directly tracked by Yvonne's visual capacities or if there was some other visual indication of his presence, Yvonne would pick it up. They are *her* visual capacities, after all. In (ASSASSINATION), if BBC News had reported that the Prime Minister had been assassinated, Freya would have picked it up because she was watching the news. In (TORRES), if there had been any recollection of Torres scoring more than 25 league goals in his first season at Liverpool, Crispin would have registered it. After all, he is the one whose memory would have brought about the recollection. Finally, in (COMMUNIST), if the investigation into Mr X's background had led to evidence suggesting that he was a communist, the FBI—including the spokesperson—would have picked it up. It is their investigation, after all.

What we have so far is that (ECC) and (RC) jointly support the conditional premise of the absence-based inference. However, in order to have an account of the epistemic goodness of the inference, something still needs to be said about the premise that says that the subject does not possess evidence that *p*. To that end Goldberg endorses what we label the 'Absence Condition':

(AC) Enough time has passed for source *S** to track evidence supporting *p* and make it available to *S*, but no such evidence has been made available to *S* by *S**.[7] (Here *S** is a source that provides epistemic coverage for *S* relative to *p*'s domain.)

(AC) involves more than just an absence of evidence (as delivered by the relied-upon source). The condition additionally demands that sufficient time has passed for the source to track and transmit relevant evidence. This part is needed in order for the 'absence premise' (i.e. (3)) in the absence-based inference to be significant. To see this, suppose that *S* relies on *S** at a time *t*, and that at *t* insufficient time has passed for *S** to track and transmit *p*-evidence. In that case there will be an absence of evidence that *p*. However, since *S** may deliver evidence in favour of *p* at a later point, the absence of

[7] This is what Goldberg calls the 'silence condition'.

evidence in *p*'s favour at *t* should not be regarded as significant. It would be premature to do so: the absence is simply due to the fact that S^* has not had enough time to operate.

(AC) is satisfied in the four cases we have relied on so far. In (COMMON ROOM) enough time has passed for Yvonne's visual capacities to scan the common room for people, and they have not supplied any information to the effect that John is present. In (ASSASSINATION) Freya has been watching BBC News for the past four hours—sufficiently long for the network to report the Prime Minister's assassination if he had indeed been assassinated. Yet, no such news item has appeared. In (TORRES) Crispin thinks hard about the question whether Torres scored more than 25 league goals in his first season at Liverpool. He does so for one minute—ample time for an avid supporter—and has no recollection that would support an affirmative answer to the question. In (COMMUNIST) the FBI has conducted a thorough investigation of Mr X's background. Thus, enough time has passed to collect evidence to the effect that Mr X is a communist and transmit this to the spokesperson if any such evidence was available. However, the spokesperson has received no evidence of this kind.

In this section, we have seen what it takes for absence-based inference to be epistemically good according to Goldberg. The proposal is the following: absence-based inference is epistemically good if (ECC), (RC), and (AC) are satisfied. (ECC), the Epistemic Coverage Condition, puts a demand on the relied-upon source. The source must be sufficiently evidentially connected to the domain and make collected evidence available to the subject. However, it is not enough that the source is evidentially hooked in and transmits evidence. The subject must register the evidence that is made available to her. This is what (RC), the Receptivity Condition, requires. As seen above, (ECC) and (RC) jointly support the conditional premise—i.e. (2)—of the absence-based inference. Lastly, (AC), the Absence Condition, states that enough time has passed for the relied-upon source to track and transmit evidence, but that it has transmitted no evidence. This condition supports (3) of the absence-based inference.[8]

[8] Goldberg uses the labels 'source-existence condition', 'reliable-coverage condition', 'sufficient interval condition', 'silence condition', and 'receptivity condition' (2010a: 158–165). He takes these five conditions to be sufficient for what he calls 'K-reliability', i.e. reliability that yields knowledge when paired with true belief. They are also sufficient for what he calls 'coverage-based beliefs'. What we refer to as the 'Epistemic Coverage Condition' collapses Goldberg's source-existence, reliable-coverage, and sufficient interval conditions. Also, importantly, what we have chosen to call 'absence-based belief' is what Goldberg calls 'coverage-based belief'. We prefer our label to Goldberg's for the following reason: both beliefs based on the presence of evidence and beliefs based on the absence of evidence can be

3. T-principles and E-principles

Bearing in mind Goldberg's reliabilist framework, the claim that satisfaction of (ECC), (RC), and (AC) is sufficient for epistemically good absence-based inference amounts to the claim that this kind of inference is a reliable way of forming beliefs. In the remainder of the paper we hope to offer considerations that further develop the epistemology of absence-based inference. In this section we approach the epistemic goodness of absence-based inference through a comparison between alethic and evidential principles. According to the well-known Equivalence Schema, it is true that *p* if and only if *p*. We suggest that epistemic coverage and receptivity sustain a suitably qualified evidential analogue of the Equivalence Schema: for a high proportion of values of *p*, subject *S* has evidence that *p* due to her reliance on source *S** if and only if *p*. Once this idea is in place, the reliability of the kind of absence-based inferences we have discussed follows naturally.

Let '*T*(*p*)' read 'It is true that *p*'. With this notation in place we can go on to formulate the well-known Equivalence Schema as follows:

(T1) $T(p) \leftrightarrow p$,

i.e. it is true that *p* if and only if *p*. Further well-known schemas concerning truth include the following:

(T2)	$T(p \vee \sim p)$	i.e. it is true that *p* or ~*p*.
(T3)	$T(p) \vee \sim T(p)$	i.e. it is true that *p* or it is not true that *p*.
(T4)	$T(p) \vee T(\sim p)$	i.e. it is true that *p* or it is true that ~*p*.
(T5)	$\sim T(p) \leftrightarrow T(\sim p)$	i.e. it is not true that *p* if and only if it is true that ~*p*.

(T2) is the Law of Excluded Middle. (T3) and (T4) are both versions of Bivalence. The difference between the two is whether negation or the truth-operator takes wide-scope in the second disjunct: in (T3) the truth-operator lies within the scope of negation, whereas in (T4) it is the other way around. (T5) is the Negation Equivalence.

'coverage-based' in the sense of satisfying the Epistemic Coverage Condition. By using the label 'absence-based belief' the aspect that is specific to the former kind of belief is highlighted.

According to this schema, negation and the truth-operator commute with one another, i.e. the order of the two can be switched. All of the above schemas are components of classical logic and semantics.[9]

Let us now move from alethic schemas to evidential schemas. Let '$E^{S}_{S^*}(p)$' read '*S* has *S**-evidence that *p*' and let '*S**-evidence that *p*' denote *p*-evidence that *S* possesses due to her reliance on *S** and that is sufficiently good to justify belief in *p*. Consider now the evidential counterparts of (T1)- (T5):

(E1)	$E^{S}_{S^*}(p) \leftrightarrow p$	i.e. *S* has *S**-evidence that *p* if and only if *p*.
(E2)	$E^{S}_{S^*}(p \vee \sim p)$	i.e. *S* has *S**-evidence that *p* or ~*p*.
(E3)	$E^{S}_{S^*}(p) \vee \sim E^{S}_{S^*}(p)$	i.e. *S* has *S**-evidence that *p* or it's not the case that *S* has *S**-evidence that *p*.
(E4)	$E^{S}_{S^*}(p) \vee E^{S}_{S^*}(\sim p)$	i.e. *S* has *S**-evidence that *p* or *S* has *S**-evidence that ~*p*.
(E5)	$\sim E^{S}_{S^*}(p) \leftrightarrow E^{S}_{S^*}(\sim p)$	i.e. it is not the case that *S* has *S**-evidence that *p* if and only if *S* has *S**-evidence that ~*p*.

Let us use 'Evidential Equivalence Schema' to refer to (E1). (E2) is an evidential version of the Law of Excluded Middle, while (E3) and (E4) are evidential versions of Bivalence. (E5) is an evidential version of the Negation Equivalence according to which the evidence-operator and negation commute (we use 'Evidential Negation Equivalence' as a label for (E5)). Given our reading of the evidence-operator, all schemas are relativized to subject *S* and source *S**.

In our discussion we treat principles (E1)-(E5) as being relativized to a particular domain that the subject investigates by relying on certain sources. This is what the characterization of epistemic coverage—a domain-relativized notion—calls for. The relativization of (E1)-(E5) can be made explicit by simply prefixing each principle with 'For domain *D*'. However, since context makes it clear that the relativization is intended, we allow ourselves to leave it implicit.

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[9] Two remarks. First, many take the semantic paradoxes to show that at least some of the alethic principles must be restricted. Second, (T2), (T3), and (T4) are pairwise equivalent in a standard classical setting. However, some think that the schemas come apart in certain contexts. For example, in connection with vagueness, supervaluationists endorse (T2), but believe that (T4) fails for borderline cases.

(E1)-(E5) are evidential schemas. As such, they are epistemic schemas. As already noted, (T1)-(T5) are standard components of classical logic and semantics. For a variety of reasons, many people feel a pull towards classical logic and semantics and endorse the full package consisting of (T1)-(T5). The package consisting of (E1)-(E5) is a different story, though. (E2) and (E3) might well find support among people who buy into classical logic and semantics.[10] However, even among 'classicists', (E1), (E4), and (E5) would seem questionable. Without qualification or restriction the schemas are simply too strong. One way to see this is to look at (E1), (E4), and (E5) alongside their alethic counterparts.

(T1) says that the truths match up precisely with what is the case. This does not seem all that implausible. Turn now to (E1). This schema says of subject *S* and a source S^* that *S* tracks *exactly* what is the case through S^*-evidence. In effect, if this were the case, relying on S^* would constitute a decision procedure for *S* for any question whatsoever. This, by contrast, seems completely implausible. No source that any ordinary subject relies on is sufficiently powerful to achieve this, not even by a long shot.[11]

Consider now (T4): $T(p) \vee T(\sim p)$. Any instance of this schema follows by basic logical reasoning ($\vee$-elimination) from the relevant instance of the Law of Excluded Middle and (T1). Analogously, any instance of (E4) follows by basic logical reasoning from the relevant instance of the Law of Excluded and (E1). Let us just assume the Law of Excluded Middle. Even so, while (T1) is very plausible, we have just seen that (E1) is just the opposite—and so, it is not possible to make a case for the plausibility of (E4) on the basis of the Law of the Excluded Middle and (E1). But this seems to be the right result: (E4) is not the kind of schema that is plausible in full generality. Just think about what it tells us: for any *p*, *S* has S^*-evidence that *p* or S^*-evidence that $\sim p$. It is easy to think of examples that undermine this idea. Consider, for example, the

[10] In standard classical logic any argument with a logical truth as its conclusion is valid—a special case being the case where there are no premises. Thus, one might think that anyone who entertains a logical truth has thereby instantiated a valid argument form, namely the special case just mentioned. Since the premises of a valid argument provide evidence for the conclusion, we get the following in the special case where a subject entertains an instance of the Law of Excluded Middle: the empty set of premises gives the subject evidence for the relevant instance of the Law of Excluded Middle. This line of reasoning might be taken to support (E2). As for (E3), any instance is derivable from (T1) and (T2). Hence, anyone who buys into (T1) and (T2) should also buy into (E3).

[11] Even when restricted to a specific discourse or domain, there may be some domains for which one could not realistically hope for anything like (E1). Arithmetical discourse—and any kind of discourse with the resources to express elementary arithmetic—might be of this kind due to the incompleteness results.

statement 'The number of particles in Chicago at *t* is even' where *t* is some specific time. It seems clear that there is no source that any subject could rely on that would deliver evidence good enough to justify belief in this statement or evidence good enough to justify belief in its negation.[12] Thus, we should not be able to make a case for the unrestricted plausibility of (E4)—neither by appealing to (E1) nor in any other way.

Consider now (T5): $\sim T(p) \leftrightarrow T(\sim p)$. This schema tells us that negation and the truth-operator commute. Given (T1), it is easy to prove instances of (T5). Analogously, given (E1), it is easy to prove instances of (E5) (i.e. $\sim E^{S}_{S^*}(p) \leftrightarrow E^{S}_{S^*}(\sim p)$). However, as before, while (T1) seems plausible, (E1) does not. Hence, we cannot make a case for the plausibility of (E5) by appealing to (E1). This is precisely what we want, though: (E4) is not the kind of schema that is plausible in full generality. What the schema tells us for any particular *p* is that *S*'s failing to possess any *S**-evidence that *p* amounts to *S*' having *S**-evidence that ~*p*. We note that makes the schema fit a version of the slogan 'absence of evidence is evidence of absence'. In our present context, given our reading of the evidence-operator, the version of the slogan we get is the following: *S*'s failing to possess evidence sufficiently good to justify belief in *p* amounts to *S*'s having evidence sufficiently good to justify belief in ~*p*. This slogan has received a lot of bad press—and rightly so. Indeed, scientists have a counter-slogan: absence of evidence is *not* evidence of absence.[13] Or more fully: absence of evidence sufficiently good to justify belief in *p* is *not* evidence sufficiently good to justify belief in ~*p*.

It is not difficult to see why the slogan in question has received bad press. To see this pedestrian, non-scientific examples will do. Suppose that Peter is told that a soccer jersey with Lionel Messi's signature and the text '2012: 91' has been hidden somewhere in Seoul, Paris, Cairo, Sao Paulo, or Los Angeles. The hiding place could be anywhere within the limits of these five cities. Being a big Messi fan, Peter is determined to find the jersey and spends the next 7 years of his life searching for the

[12] A clarificatory comment: one might think that it is impossible to offer evidence for the statement in question and impossible to offer evidence against it because Chicago has vague boundaries. However, even assuming that vagueness is not an issue, we take it that the point about evidence remains.

[13] The counter-slogan was famously—and, we are inclined to think, unwarrantedly—invoked by former US Defense Secretary Donald Rumsfeld in response to critics of the war in Iraq. According to Rumsfeld, the absence of evidence that there were WMDs in Iraq did not amount to evidence that there were no WMDs in Iraq. For an interesting investigation of absence of evidence and evidence of absence within a probabilistic framework, see Sober (2009). This section of the present paper and the two to follow offer a discussion of the same theme. Goldberg does not engage extensively or systematically with the theme, but does touch on it in passing (see, e.g., (2010b: 251)).

jersey in Seoul. During this time Peter fails to find any evidence whatsoever that the jersey is in Seoul. It would seem that there is an absence of evidence sufficiently good to justify believing that the jersey is in Seoul—that is, no such evidence is possessed by Peter. However, in this situation it is clear that this absence does not amount to there being evidence of absence—or, more fully, evidence sufficiently good to justify belief in absence. After all, although Peter searched for a full 7 years, he did so single-handedly and Seoul is a very big city. In light of this example—and plenty others—it is clear that (E4) in an unrestricted form cannot be plausible. For this reason it would be rather unfortunate if we were able to make a case for the plausibility of the schema by appealing to (E1)—or some other principle or schema for that matter.

Above we have observed some crucial differences between some of the alethic schemas and their evidential counterparts, i.e. between, on the one hand, (T1), (T4), and (T5) and, on the other, (E1), (E4), and (E5). The next step is to see when, if ever, we can move in the opposite direction. We leave (E4) and (E5) for the next section. Our claim regarding (E1) is the following:

(HPT) *High Proportion Thesis:*
If (ECC) and (RC) are satisfied, then a high proportion of instances of (E1) are true.

What (HPT) tells us is this: given satisfaction of the Epistemic Coverage Condition and the Receptivity Condition, the (alethic) Equivalence Schema and the Evidential Equivalence Schema come relatively close. We say 'relatively close' because we do *not* have the following: for every instance of the Equivalence Schema (T1), the corresponding instance of the Evidential Equivalence Schema (E1) is true. The reason is the following: (T1) is supposed to hold for any *p*, the only possible exceptions being paradox-generating propositions and other tough cases. However, (E1) is not meant to apply as generally—even given satisfaction of the Epistemic Coverage Condition and the Receptivity Condition. The schema merely applies in a high proportion of cases. Nonetheless, this is still closer to the proportion of cases in which (T1) applies than if epistemic coverage is absent.

Now let us take on the task of supporting (HPT). We start by making two observations. First, sources that provide epistemic coverage possess a high level of competence and effectiveness. By this we mean that these sources typically transmit

evidence that is sufficiently good to justify belief in *p* precisely when *p* is the case. Second, we note that for any given instance of the schema $E^{S}_{S^*}(p) \leftrightarrow p$, *p* is true or *p* is false. In the former case, if $E^{S}_{S^*}(p)$ is true, the relevant instance of the bi-conditional is true. In the latter case, if $E^{S}_{S^*}(p)$ is false, the relevant instance of the bi-conditional is true. Bearing in mind the second observation we see that (HPT) can be supported by arguing that (i) in most cases where *p* is true, then so is $E^{S}_{S^*}(p)$, and (ii) in most cases where *p* is false, so too is $E^{S}_{S^*}(p)$. We provide such an argument by relying on our first observation and the Receptivity Condition. Suppose that the Receptivity Condition is met, and consider the true and false cases in turn. Suppose that *p* is true. Given our first observation, we have this: typically, a coverage-sustaining source S^* transmits S^*-evidence that *p* precisely when *p* is the case. Thus, in most cases, if *p* is true, then S^* transmits S^*-evidence that *p*. Given receptivity, this means that in most cases where *p* is true, $E^{S}_{S^*}(p)$ is true too—as desired. Now, suppose that *p* is false. Again, given our first observation we have that, typically, a coverage-sustaining source S^* transmits S^*-evidence that *p* precisely when *p* is the case. But this yields that, in most cases, if *p* is false, S^* does not transmit S^*-evidence that *p*. This means that in most cases where *p* is false, $E^{S}_{S^*}(p)$ is false too—as desired. In sum: most *p*-true and most *p*-false instances of (E1) come out true. This suffices to show that a high proportion of instances of (E1) are true. We worked on the assumption that the subject possesses epistemic coverage and is receptive to evidence transmitted by the source—and, so, the argument just presented supports (HPT).

Let us note three things. First, saying that a high proportion of instances of (E1) are true is compatible with a proportion of instances of (E1) being false. Indeed, there will typically be false instances of the Evidential Equivalence Schema since sources that provide epistemic coverage are usually not perfect. They can—and are likely to be—imperfect in at least one of two ways. The source is likely to be fallible. It may be that it transmits evidence that *p* although *p* is false.[14] The other way in which relied-upon sources may be imperfect is this: a source is not guaranteed to catch evidence for every fact that the subject is interested in, and so, is not guaranteed to transmit evidence for every such fact.

[14] A recent example of this is *Der Spiegel's* premature online publication of an obituary for George W. Bush (Sr.) on December 30, 2012.

Second, consider a subject *S* that relies on source *S** for epistemic coverage relative to domain *D*. One might wonder whether there are any truths for which no evidence could ever be tracked by *S**. Suppose that there are such truths and that *p* is one of them. In that case, although *p* is the case, no evidence is tracked by *S**—and so, no evidence is transmitted to *S*. This means that the relevant right-to-left instance of (E1) is false. In light of this observation, let us make explicit an assumption that we are making in our treatment of the right-to-left direction of (E1). We are assuming that, for most truths within the relevant domain, evidence is available for the source to track and transmit to the subject. This suffices for the case in favour of (HPT) and is consistent with there being some truths for which no evidence could ever be tracked and transmitted by the source.

Third, having merely a high proportion of instances of (E1) come out true is good enough for the reliability of the type of absence-based inferences we have discussed. To see this recall the structure of these inferences (here modified to factor in the notation introduced in this section):

(2) If it is not the case that *S* has *S**-evidence that *p*, then ~*p*.
(3) It is not the case that *S* has *S**-evidence that *p*.
(4) So, ~*p*.

Note that (2) is the contrapositive of the right-to-left direction of (E1). As such, the argument given above in favour of (HPT) supports the idea that a high proportion of instances of (2) are true. Since we are interested in spelling out the epistemic goodness of absence-based inferences where (ECC), (RC), and (AC) are all satisfied, (3) obtains—it follows immediately from (AC). The inference in (2)-(4) is valid; it is modus ponens. Given the validity of (2)-(4), the truth of (3) in all cases of interest and the high proportion of true instances of (2) across those very same cases, we get that a high proportion of instances of (4) are true. This means that a high proportion of beliefs arrived at via absence-based inference are true. However, this is just to say that absence-based inference is a reliable way of forming beliefs.[15]

[15] There are different ways to think of reliability. Some think of reliability just in terms of actual world track record. Others take reliability to consist in actual world track record plus truth in nearby worlds. We note that the latter, more demanding conception is consistent with our proposal in that the pertinent beliefs may include both actual and merely possible beliefs. In Section 5 we also explain how our proposal can be understood in probabilistic terms.

4. Absence of evidence is evidence of absence

In the previous section, it was shown why satisfaction of (ECC), (RC), and (AC) suffices for the reliability of a certain type of absence-based inference. We approached the issue of reliability through a comparison of alethic and evidential principles. The argument developed addresses the issue of reliability in a more direct manner than Goldberg's own work. Our hope is that the material of Section 3 will be regarded as shedding some helpful light on the interesting—and, we think, fundamentally correct—proposal presented by Goldberg.

In the previous section we made a case for (HPT), the thesis that satisfaction of (ECC) and (RC) delivers a high proportion of true instances of (E1) within the relevant domain. This section is dedicated to exploring the consequences of there being a high proportion of true instances of (E1)—which really amounts to an investigation of further consequences of (ECC) and (RC). As we argue below, there are some rather striking consequences.

Consider the following two claims concerning the relationship between (E1) and respectively (E4) and (E5):

(HPE4) If a high proportion of instances of (E1) are true, then a high proportion of instances of (E4) are true.

(HPE5) If a high proportion of instances of (E1) are true, then a high proportion of instances of (E5) are true.

(HPE4) and (HPE5) suggest that there is a close connection between respectively (E1) and (E4) and between (E1) and (E5). Below we support (HPE4) and (HPE5) by giving a two-step argument. The first step is a derivation of (E4) and (E5) from (E1). Here are the derivations:

$E^{S}_{S^*}(p) \leftrightarrow p \models E^{S}_{S^*}(p) \vee E^{S}_{S^*}(\sim p)$

Proof: assume (E1), i.e. $E^{S}_{S^*}(p) \leftrightarrow p$. Assume that $p \vee \sim p$ (theorem introduction) and suppose that p. Then $E^{S}_{S^*}(p)$, by (E1, right-to-left). Hence, by

$\vee$-I, we get $E^{S}_{S*}(p) \vee E^{S}_{S*}(\sim p)$. Now assume that $\sim p$. Then $E^{S}_{S*}(\sim p)$, by (E1, right-to-left), and $E^{S}_{S*}(p) \vee E^{S}_{S*}(\sim p)$, by $\vee$-I. So, by $\vee$-E, $E^{S}_{S*}(p) \vee E^{S}_{S*}(\sim p)$. [16]

$E^{S}_{S*}(p) \leftrightarrow p \models \sim E^{S}_{S*}(p) \leftrightarrow E^{S}_{S*}(\sim p)$

Proof: assume (E1), i.e. $E^{S}_{S*}(p) \leftrightarrow p$. Assume that $\sim E^{S}_{S*}(p)$. Then $\sim p$, by (E1, contrapositive of right-to-left). $E^{S}_{S*}(\sim p)$, by (E1, right-to-left). Therefore, by $\rightarrow$I, $\sim E^{S}_{S*}(p) \rightarrow E^{S}_{S*}(\sim p)$. Now assume that $E^{S}_{S*}(\sim p)$. Then $\sim p$, by (E1, left-to-right). $\sim E^{S}_{S*}(p)$, by (E1, contrapositive left-to-right). Thus, by $\rightarrow$I, $E^{S}_{S*}(\sim p) \rightarrow \sim E^{S}_{S*}(p)$. Putting the two conditionals together, $\sim E^{S}_{S*}(p) \leftrightarrow E^{S}_{S*}(\sim p)$.

We now move on to the second step of the argument. It starts with the following observation: given the two derivations just provided, any true instance of (E1) will make true the corresponding instance of respectively (E4) and (E5). Now suppose that a high proportion of instances of (E1) are true. Given the observation just made, we see that it follows that a high proportion of instances of respectively (E4) and (E5) are true. In sum: if a high proportion of instances of (E1) are true, the same goes for (E4). That is to say, (HPE4) is true. Similarly, if a high proportion of instances of (E1) are true, a high proportion of instances of (E5) are true. That is, (HPE5) is true.

Now recall (HPT), the thesis that (ECC) and (RC) implies a high proportion of true instances of (E1). By the transitivity of the conditional, (HPE4), and (HPE5), we get that (ECC) and (RC) implies a high proportion of true instances of (E4) as well as a high proportion of true instances of (E5). These consequences are rather striking. Recall that (E1), (E4), and (E5) are the three evidential schemas that are wildly implausible when considered without restriction. In Section 3 we argued that a 'high proportion version' of (E1) is true, on the assumption of epistemic coverage and receptivity. What we see now is that this version of (E1) brings with it corresponding versions of (E4) and (E5)—the upshot being that 'high proportion versions' of (E4) and (E5) hold good for domains relative to which a subject enjoys epistemic coverage.

Let us remind ourselves that (E5) is the schema sloganized by 'absence of evidence is evidence of absence'—or, again, using our more elaborate version, absence of evidence sufficiently good to justify belief is evidence sufficiently good to

[16] $E^{S}_{S*}(p) \vee E^{S}_{S*}(\sim p)$ is logically equivalent to $\sim E^{S}_{S*}(p) \rightarrow E^{S}_{S*}(\sim p)$, to be derived from (E1) below. Given the noted equivalence, we could strictly speaking omit this proof and just give the one below.

justify belief in absence. As we see now, a high proportion of instances of the schema are true provided that the subject enjoys epistemic coverage and is evidentially receptive. Some might find it suprising that absence of evidence amounts to evidence of absence, even under these conditions. The difficulty, we suspect, stems from the left-to-right direction of the schema—the direction that says that, if it is not the case that *S* has *S**-evidence that *p*, then *S* has *S**-evidence that ~*p*. We set this matter aside for now, but return to it in Section 5.

The good epistemic standing of (E5) has a number of ramifications—one, notably, having to do with absence-based inference. Consider:

(2#) If it is not the case that *S* has *S**-evidence that *p*, then *S* has *S**-evidence that ~*p*.

(3#) It is not the case that *S* has *S**-evidence that *p*.

(4#) So, *S* has *S**-evidence that ~*p*.

Like the inference in (2)-(4) the inference in (2#)-(4#) is absence-based. An argument similar to the one developed in the previous section to support the reliability of the absence-based inference in (2)-(4) can be given to support the reliability of the absence-based inference in (2#)-(4#). Indeed, more generally, the same goes for any other absence-based inference whose epistemic goodness can be sustained by (ECC), (RC), and (AC).

5. Absence of evidence is evidence of absence—*why*?

In this section we subject (E4) to further discussion. To recap, our view is this: (E4) does not hold without qualification. First, in our discussion we have relativized (E4) to specific domains, and second, within these domains the principle only holds provided that certain conditions are met. Now, the reason why we want to subject (E4) to further discussion is something already flagged: it may be quite hard to see how absence of *S**-evidence that *p* can amount to *S**-evidence that ~*p*. Just consider the latter—i.e. *S**-evidence that ~*p*—and think about what kinds of characteristics it ought to have. As a bare minimum it should support the truth of ~*p*. It is evidence, after all. Stronger yet, it is evidence sufficiently good to support belief in ~*p*. But now turn to the other half of the equation, the absence of *S**-evidence that *p*. How can an absence

of evidence sufficiently good to justify belief in p amount to evidence sufficiently good to justify belief in $\sim p$? If it cannot, it is difficult to see how the two sides of the equation could meet in a philosophically sensible way, given our understanding of the ingredient notions. We approach the task at hand by emphasizing that $\sim E^{S}_{S^*}(p)$ must be looked at in a specific context—namely, one in which the subject enjoys epistemic coverage for the relevant domain and is receptive to evidence transmitted by the source that provides the coverage.

Since our discussion in the present paper has been cast against the background of reliabilism, let us try to engage with the above issue in a way that is congenial to reliabilism. We thus address the above issue by formulating a proposal in terms of likelihood or probability, the kind of notion in terms of which reliabilism is standardly understood. The proposal starts from the observation that the probability of $\sim p$ conditional on $\sim E^{S}_{S^*}(p)$—that is, $Prob(\sim p \mid \sim E^{S}_{S^*}(p))$—is high. This is a sense in which $\sim E^{S}_{S^*}(p)$ can be said to support the truth of $\sim p$, and so, can be said to be evidence that $\sim p$. However, merely saying this is too easy. It does not engage with the task of explaining why the probability of $\sim p$ conditional on $\sim E^{S}_{S^*}(p)$ is sufficiently high to justify belief in $\sim p$. As such, the mere talk of conditional probability falls short of explaining how $\sim E^{S}_{S^*}(p)$ could yield $E^{S}_{S^*}(\sim p)$.

Here is our attempt to engage with this explanatory task:

Recall that we are looking at $\sim E^{S}_{S^*}(p)$ in the context of epistemically good absence-based inferences. In this context $\sim E^{S}_{S^*}(p)$ should not be considered in isolation, but against the background of (ECC) and (RC). Against this background we can see why the probability of $\sim p$ conditional on $\sim E^{S}_{S^*}(p)$ should be high and why it this yields $E^{S}_{S^*}(\sim p)$.

We have seen that (ECC) and (RC) support the following claim: a high propertion of instances of (E1) are true (where, again, (E1) is the schema: $E^{S}_{S^*}(p) \leftrightarrow p$). Now consider the relevant instance of (E1). What we have for this instance is $\sim E^{S}_{S^*}(p)$. In order for the instance to be true it needs to be the case that $\sim p$. Since a high proportion of instances of (E1) are true, it is likely that the instance under consideration is true. Hence, if $\sim E^{S}_{S^*}(p)$ is true, it is likely that $\sim p$ is true, too—which is to say that the probability of $\sim p$ conditional on $\sim E^{S}_{S^*}(p)$ is high. In light of this we have an explanation of how $\sim E^{S}_{S^*}(p)$ supports the truth of $\sim p$: given epistemic coverage and receptivity, $\sim E^{S}_{S^*}(p)$ makes the truth of $\sim p$ highly likely.

Since evidence for p is the kind of thing that supports the truth of p, $\sim E^{S}_{S^*}(p)$ amounts to evidence that $\sim p$. However, in our present context, what we need is something slightly more specific: we need $\sim E^{S}_{S^*}(p)$ to amount to $E^{S}_{S^*}(\sim p)$, i.e. evidence that S has due to reliance on S^* and that is sufficiently good to justify belief in $\sim p$. Do we have this? Yes. For remember that we are running along reliabilist lines and should understand the notion of justification accordingly. Whether $\sim E^{S}_{S^*}(p)$ is sufficiently good to justify belief in $\sim p$—and so, amount to $E^{S}_{S^*}(\sim p)$—boils down to the question whether arriving a belief that $\sim p$ via $\sim E^{S}_{S^*}(\sim p)$ is a reliable belief-forming process. It is, for the following reason: in our present context, when forming a belief in $\sim p$ on the basis of $\sim E^{S}_{S^*}(\sim p)$, this belief is likely to be true. This concludes our explanation. We have given a reliabilist explanation of how, given epistemic coverage and receptivity, absence of evidence sufficiently good to justify belief amounts to evidence sufficiently good to justify belief in absence.

6. Conclusion

Our overarching goal in this paper has been to contribute towards a fuller understanding of the epistemology of absence-based inference. We took our cue from Goldberg's work on epistemic coverage, presenting it in considerable detail—and with some modifications—in Section 2. We believe that Goldberg is right in taking satisfaction of the Epistemic Coverage Condition, Receptivity Condition, and Absence Condition to be sufficient for the reliability of a certain type of absence-based inference. However, at the same time, he does not in a direct manner address how the relevant type of absence-based inference gets to count as reliable. We did so in Section 3. Our approach was to compare certain well-known alethic principles and their evidential counterparts. Central to our comparison was the Evidential Equivalence Schema, an evidential counterpart of the (alethic) Equivalence Schema. We argued that the effect of epistemic coverage and evidential receptivity with respect to a given domain is that a high proportion of instances of the Evidential Equivalence Schema are true. On this basis we showed that the specific type of absence-based inference that Goldberg discusses—and the one we started out with here—makes for a reliable inference pattern. Section 4 continued our comparison of alethic and evidential principles. We established an interesting result: given epistemic coverage and evidential receptivity, the gap between the alethic and evidential principles becomes

quite small. All evidential principles considered come out with a high proportion of true instances. Furthermore, we discussed the idea that absence of evidence sufficiently good to justify belief amounts to evidence sufficiently good to justify belief in absence. This idea has received a lot of bad press—and rightly so. It is implausible when considered in full generality. However, interestingly, for domains with epistemic coverage a high proportion of instances of this controversial principle come out true. As a result, we were able to add to our stock of reliable absence-based inferences a type of inference that involves a transition from absence of evidence to evidence of absence. However, this immediately raised the issue how to make philosophical sense of the idea that absence of evidence amounts to evidence of absence (again, understood specifically in the manner above). We addressed this issue in Section 5, giving an account congenial to the reliabilist framework within which this paper has been set.

We hope to have succeeded in making a contribution towards a better understanding of the epistemology of absence-based inference. Understanding the epistemology of absence-based inference puts us in a position to appreciate what is epistemically good about the absence-based inferences in the cases presented at the outset of the paper. It likewise has the potential shed light on a number of issues in theoretical and applied epistemology. Let us briefly give just one example. There is a very extensive epistemological literature on testimony. Within this literature there is a sizable sub-literature on expert testimony—an issue that cuts across theoretical and applied epistemology.

If an expert says that p (for some p within the relevant domain of expertise), this is typically thought to constitute evidence sufficiently strong to justify belief in p. Not so for novice testimony. The presence of information disseminated by experts is epistemically significant in a way that information disseminated by novices is not. It is interesting to note that the same point applies to informational absences. If no expert has said that p after sufficient time to investigate the matter (for some p within the relevant domain), this is typically thought to constitute evidence sufficiently strong to justify belief in $\sim p$. Not so for the absence of novice testimony. The notion of epistemic coverage gives us a way to understand these differences, or the distinctive epistemic significance possessed by the presence and absence of information from experts. What sets expert testimony and novice testimony apart is this: novices are not evidentially hooked into the domain in the way that experts are. Relative to the

relevant domain experts provide epistemic coverage. Novices, on the other hand, do not.

References

Copi, I. (1953). *Introduction to Logic*. New York: Macmillan.

Gelfert, A. (Forthcoming). Coverage-Reliability, Epistemic Dependence, and the Problem of Rumor-Based Belief. To appear in *Philosophia*. DOI 10.1007/s11406-012-9408-z.

Goldberg, S. (2011). If that were true I would have heard about it by now. In A. Goldman & D. Whitcomb (eds.): *The Oxford Handbook of Social Epistemology* (92–108). Oxford: Oxford University Press.

Goldberg, S. (2010a). *Relying on Others: An Essay in Epistemology*. Oxford: Oxford University Press.

Goldberg, S. (2010b). The Epistemology of Silence. In A. Haddock, A. Millar & D. Pritchard (eds.): *Social Epistemology* (243–261). Oxford: Oxford University Press.

Hurley, P. (2011). *A Concise Introduction to Logic*, 11th edition. Boston: Wadsworth Publishing.

Sober, E. (2009). Absence of Evidence and Evidence of Absence: Evidential Transitivity in Connection with Fossils, Fishing, Fine-Tuning, and Firing Squads. *Philosophical Studies* 143: 63–90.

Walton, D. (1999). The appeal to ignorance, or *argumentum ad ignorantiam*. *Argumentation* 13: 367–377.