Unconscious Knowledge and Epistemic Status

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Abstract

- **Abstract:** Some fields of contemporary psychology and cognitive science unproblematically speak of "unconscious knowledge" to describe a group of phenomena in which people show *available* knowledge to which they apparently have no conscious *access*. If anything, this concept is nonsensical for a philosophical analysis that focuses on beliefs as they are held by *conscious* rational agents. This philosophical 'bias' is firmly grounded on a deontic-transcendental concept of knowledge that puts the cart before the horse, i.e. makes truth precede belief. I argue by putting the horse before the cart: because beliefs precede the truth or falsity of *p*, a valuation that requires some kind of verification, unconscious beliefs, too, can satisfy the basically useful view of knowledge as justified true belief. With practical ends in view, I show how current logical models of belief representation allow of a formal manipulation of unconscious (also: implicit) beliefs, and offer suggestions on how to create knowledge representations that take unconscious belief into full account.

- **Key concepts**: unconscious knowledge - belief - belief ascription - positive epistemic status - perception disorders - unconscious cognition - automatic behaviour - logic of implicit belief - pragmatism

Objective, methodology, & inspiration

- **Objective**: To argue that unconscious *knowledge* is epistemically on the same footing with conscious *knowledge—or* knowledge *simpliciter—*, namely because unconscious beliefs can have a (much desired) **positive epistemic status**.

- **Methodology**: experimental philosophy, i.e. the taking into account of data from the empirical-quantitative sciences [in this case, experimental cognitive (neuro)psychology] together with more orthodox philosophical methods such as analysis and formalization.

- **Inspiration**: Pragmatism and naturalized epistemology.

Making a Theory of Unconscious Knowledge

- Making a theory of unconscious knowledge requires the same steps considered necessary for the making of a theory of—conscious—knowledge:

  - A theory of belief and belief ascription;

  - A theory of positive epistemic status;

  - A formalization, i.e. something not really essential from the philosophical viewpoint (it gives scientific respectability to a philosophical theory), but that may have important practical implementations in AI.

Belief

- I hold an **instrumentalist** stance towards belief: beliefs are mere artefacts useful for analysis in philosophy and (folk-)psychology, in the same way as the equator is a useful 'fiction' in geography;

- My stance is also **"functionalist"** in that behaviour is a function of belief: by the inverted comas, I mean to say that beliefs do not merely *cause* a specific behaviour; they *are* that behaviour [this does not obliterate the fact that there is behaviour *prima facie* without belief as, e.g. motor reflexes in a state of deep coma];

- Lastly, that beliefs can be seen as propositional attitudes is solely a strategy to allow for analysis of mental states and behaviour ultimately based on a natural language; for my part, the extremely useful—in that it is highly amenable to **formal treatment**—symbol *p* does not necessarily stand for a proposition: it represents any belief-like mental content.

Belief & Action

i. Beliefs are **causal/functional** in that they prompt subjects to act in a specific way; behaviour/action is a *function* of the belief(s) held;

ii. They are **determining** (rather than determinative) with respect to behaviour;

iii. They are **species-specific** and **social**: a belief-holding species has a vast, yet finite, range of attitudes that issue from commonly held/holdable beliefs;

iv. They are **sharable** and *(in)directly observable*: neither a belief-holding subject nor the observers need to make—linguistically—explicit the belief behind a determinate action except in special situations, for e.g. in case of doubt.

Belief Ascription

- **"The default ascriptional rule is to assume that another person's view [belief] is the same as one's own *except where there is explicit evidence to the contrary.*"** (Ballim & Wilks, 1991)

(1) Acting in a specific way x does not [in certain circumstances] entail that S *only* believes that p, but it entails that S *also* believes that p.

E.g.: Brenda was reading a book when the doorbell rang. She opened the door.

Among the many beliefs relevant for Brenda's opening the door is the belief that one can open doors/doors can be opened. One's opening a door is an action that entails the belief—among other beliefs—that one can open doors/doors can be opened.

(2) When an 'approved' belief-holding subject S belonging to a specific community acts in a specific way x **because** s/he believes that p, S^*, a member of the same community and assumed to be also an 'approved' belief-holding subject, acting in a similar way x, *ceteris paribus,* may be said to *also* believe that p.

Behaviour as a Function of *Prima Facie* Unconscious Beliefs

- D.F., who has visual-form agnosia, showed that she can avoid an obstacle when reaching for a target (Milner et al., 1991)
- Asked to reach between two objects, patients suffering from visual neglect avoided obstacles on their left (McIntosch et al., 2003, 2004)
- In multiple studies with artificial grammars of finite languages, Dienes and colleagues have shown that subjects who are exposed to them, while claiming that they are literally guessing consistently perform significantly above chance in discriminating between grammatical and non-grammatical formulas
- Faced with forced-choice guessing, patients suffering from blindsight correctly discriminate shapes (Weiskrantz, Cowey, etc – multiple studies)
- More importantly in behavioural terms, patients with blindsight can covertly discriminate emotional facial expression (affective blindsight; De Gelder at al., 1999; Alfons Hamm et al., 2003)
- António Damásio and colleagues (1988, 1995) showed that prosopagnosics can covertly discriminate 'familiar' faces
- Amnesic patients can show intact priming even in the case of novel information (e.g.: non-words) (Cermak et al., 1988)
- Bechara, Damásio, and colleagues (1997) showed that in a still pre-hunch period, long before reaching a conceptual stage when participants in a card game "knew very well that there were good and bad decks, and which decks were good and bad," they already chose more cards from the "good decks," and showed higher anticipatory SCRs (the Somatic Marker Hypothesis)

Do These People Have Knowledge?

- do patients with visual neglect and visual-form agnosia *know* that there are obstacles when they avoid them?;

- when discriminating above chance between grammatical and non-grammatical sentences of artificial languages to which they were exposed without awareness, do subjects *know* the grammatical rules?;

- do patients with blindsight *know* the shapes they correctly differentiate, and the facial expressions they discriminate?;

- people with prosopagnosia show automatic signs of recognition of familiar faces: do they *know* those faces?

- do amnesics *know* novel information they are exposed to?

- do participants in a card game *know* that specific decks are good (or bad) before having even so much as a hunch?

The Wrong Analysis of Knowledge I

According to the currently accepted philosophical interpretation(s) of knowledge, the answer is more likely than not to be "no." For many epistemologists, namely those defending internalism, these people do not even satisfy the 2nd condition of a set of three seen as necessary—if not sufficient, depending on how one copes with Gettier—for knowledge:

(i) p **is true.**

(ii) S **believes that** p**.**

(iii) S is [internally/externally] justified in believing that p.

Although externalists, namely those of a reliabilist persuasion, are happy to claim that one need not be aware of the cause of one's belief, there appears to be a great reluctance to ascribe beliefs to infants and animals (excluding e.g. Dretske, 1989), and especially to subjects whose "epistemic equipment" is not functioning properly, i.e. is unreliable (cf. Plantinga, 1988). Thus, to a greater or lesser extent, both internalists and externalists would deny there is such a thing as "unconscious knowledge."

The Wrong Analysis of Knowledge II

The fundamental flaw of this analysis of knowledge is that it puts the cart before the horse in that it postulates *Truth*—and *Falsity...*—before beliefs, which makes of beliefs—and of the rest of reality, for that matter—a property of truth and not vice-versa; in other words, reality explains truth. That is why Tarski's definition of truth (1944) wrongly seems to be of interest for an epistemological discussion of the matter: like our metaphysically biased epistemologists, but for wholly different reasons, Tarski makes the truth of *p* precede *p*: "*p*" is true iff *p*. And he does so precisely because "the semantic definition of truth implies nothing regarding the conditions under which a sentence like (1) *'snow is white'* can be asserted. It implies only that, whenever we assert or reject this **sentence**, we must be ready to assent or reject the correlated **sentence** (2): *the **sentence** 'snow is white' is true.*" (p. 361)

The Correct Analysis of Knowledge

All the subjects above succeeded in securing their wellbeing by acting on what we may term "unconscious beliefs." This is so because holding a belief, explicitly or implicitly, *is not* holding that some *p* is true: it is having a mental content *p* about the world and consequently—functionally—a propensity to act in a certain way. In other words, truth is not primarily a property of one's beliefs, but a property of one's belief **on** reality. Truth characterizes a belief *tangentially,* or *derivatively*, just as $f'(x) = 3x^2 + 4$ is true of $f(x) = x^3 + 4x - 5$; in this sense, the truth of $f(x)$ comes after it: it is $f'(x)$.

(i)   *S* **believes <that>** *p.*

(ii)   *S* **is justified in believing <that>** *p.*

(iii)   *p* **is true.**

         S **knows** *p.*

This entails that instead of postulating a world whose ontological foundations are mysterious entities, the *p*'s, that behave as truth-bearers because there is one equally mysterious *res* which happens to be even more foundational than them, *the Truth*, we postulate a world whose foundations are the attitudes of the living organisms, truth being the function that may or may not *be satisfied* by a particular attitude. The first case forces the simultaneous postulation of yet another mysterious entity, *the Falsity*, which appears to be the negation of *Truth*, and from the start—before 'reality,' or simply this world—we are faced with a solely logical realm. In other words, reality is a property of logic, and not the other way round, and *S*'s appear as mere holders of the logical substantial realm that precedes them.

The cart before the horse, or the horse before the cart?

Logic ⇨ Reality	Reality ⇨ Logic
(i_o) $\exists x\,(Tx)$	(i_o) $\exists x\,(Sx\ \&\ Bx)$
(i_o') $\exists x\,(\neg Tx) = \exists x\,(Fx)$	(i) S believes [some P]
(i_o'') $\forall y\,(Ty \vee Fy)$	(i') $\exists y\,(Py);\ P = \{p_0,\ p_1,\ p_2,\ \ldots,\ p_n\}$
(i_o''') $\exists y\,(Py);\ P = \{p_0,\ p_1,\ p_2,\ \ldots,\ p_n\}$	(i'') $Prf\,(t,\ P) \rightarrow \exists x Prf\,(x,\ P)$
(i_o'''') $\exists y\,[Py\ \&\ (Ty \vee Fy)]$	(ii) S is justified in believing that p (**$t{:}p \rightarrow p$**)
(i) $\exists y\,(py\ \&\ Ty)$	(iii) $\underline{\exists y\,(py\ \&\ Ty)}$
(i') $\exists z\,(Sz\ \&\ Bz)$	$t{:}p \rightarrow \square p$ i.e., S knows p
(ii) S believes that p	
(iii) $\underline{S \text{ is justified in believing that } p}$	
S knows p	

Justification & Truth

Perhaps more importantly—depending on how one sees this problem—this analysis of knowledge eliminates the Gettier counterexamples precisely because one cannot first state the truth of a proposition and only after this check the justification; in other words, p is known iff it is justified and *therefore* true, and not the other way round. Important features of this notion of justification are (1) every [belief that] p is amenable, in principle, to justification, because (2) **justification is checkable,** (3) **justification of a statement implies knowledge of this statement** (in the sense $\boldsymbol{J\varphi \to K\varphi}$), and (4) any justification is compatible with any other justification (adapted from S. Artemov & E. Nogina, 2005). Because justification is checkable, it depends on action, either in a scientific-empirical sense, or, in less scientific domains, in a practical sense: in the first case justification is the verification that a belief is true thanks to empirical means (e.g.: I am justified in believing that H_2O is water if chemical analysis of a glass of water and of a glass of H_2O shows that they are the same stuff); in the latter case, truth is simply that which pays off (e.g.: farmers know that potatoes should be planted at a certain time each year; by doing this, they ensure that, conditions being favourable, there will be a potato crop).

Positive Epistemic Status

(vs. Chisholm, 1966) Saying that a belief p has **positive epistemic status** is the same as saying that S knows p. A belief that p has **positive epistemic status** when S is justified in holding it, i.e. it **works** (it assures the wellbeing of the subject, it brings reward, it works towards survival of the individual and of the species; also: it verifies a scientific hypothesis). Whether S believes p consciously (S holds the **explicit belief** that p) or unconsciously (S holds the **implicit belief** that p) is irrelevant: only the **concrete results** of S's holding beliefs $p_0, p_1, ..., p_n$ are to be taken into account in a theory of knowledge.

Bye Bye, Gettier!

Clearly, this kicks the Gettier (1963) counterexamples aside, which appear to be unsolvable precisely due to the solely logical notions of truth and justification involved: in his first counterexample, failure in justification is due to wrong inference of a true belief *e* from a false belief *d*, whereas in the second, we have a belief of the form $P \rightarrow (P \lor Q)$ in which *P* is actually false but the entailment is true. But <u>nothing will give positive epistemic status to a proposition in a logical set</u>.

Thus, Smith is only justified in believing that "Jones owns a Ford" when it has been *entirely* proven that it is so; this gives positive epistemic status to this belief. Logical validity only implies p.e.s. in a conception of truth that precedes beliefs—in other words, a *logical* conception of truth, which, in my view, does not entail knowledge. [Hume (1748) knew this.]

Moreover, according to my account, Smith's belief that "The man [Jones] who will get the job has ten coins in his pocket" is not a candidate for positive epistemic status: no belief about the future is. [Again, Hume, problem of induction aside, knew that very well.]

Conclusion: Reality need not—and it probably does not—comply with 'rational' thought (probabilistic-inductive or demonstrative-deductive), i.e. there is no a priori justification. Moreover, this kind of 'rational' thought is a restricted, limited, and special way of thinking.

Why Logic, then?

Logic—namely logical truth—does not entail knowledge, but it can help throw light on **how knowledge works**. The formalization of knowledge does not yield knowledge, unless we have a way of proving that we are justified in believing that a certain logical model does so(!).

A Logic of Implicit Belief

Back to the issue of unconscious knowledge, a doxastic logic that includes implicit belief has already been proposed by Hector Levesque in 1984, in an attempt to contour the problem of logical omniscience originating in material implication, which entails the serious drawback from a modelling point of view that *every* validity must be known [e.g.: (LO1) $\vDash K\varphi$ & $K(\varphi \rightarrow \psi) \rightarrow K\psi$, (LO2) $\vDash \varphi \Rightarrow \vDash K\varphi$, (LO3) $\vDash \varphi \rightarrow \psi \Rightarrow \vDash K\varphi \rightarrow K\psi$, ...]. Given resource-limited agents, this is wholly unrealistic and unintuitive.

Levesque's Logic of Implicit and Explicit Belief: The *B* and *L* operators

By introducing two modal operators, *B* (explicit belief) and *L* (implicit belief), in a standard Kripke framework, Levesque proposed a doxastic logic in which if a sentence is a logical consequence of what is believed, then it is implicitly believed, and everything that is explicitly believed is implicitly believed:

If $\vDash \varphi$ (where φ is propositional), then $\vDash L\varphi$ and $\vDash (L\varphi \,\&\, L(\varphi \rightarrow \psi)) \rightarrow L\psi$

Moreover, $(B\varphi \rightarrow L\varphi)$.

Logical omniscience is avoided thanks to the behaviour of *B*:
1. $\{Bp, B(p \rightarrow q), \neg Bq\}$ (beliefs are not closed under implication)
2. $\{\neg B(p \vee \neg p)\}$ (a valid sentence need not be believed)
3. $\{Bp, \neg B(p \,\&\, (q \vee \neg q))\}$ (a logical equivalent to a belief need not be believed)
4. $\{Bp, B\neg p, \neg Bq\}$ (beliefs can be inconsistent without every sentence being believed)

Levesque's Logic of Implicit and Explicit Belief: Situations vs. Possible Worlds

Another aspect that is of interest for the formal manipulation of implicit beliefs is the introduction of the notion of **situation** (or partial world) replacing that of possible world; in accord with Levesque's main goal, i.e. to avoid logical omniscience, "a situation may support the truth of some sentences and the falsity of others, but may fail to deal with other sentences at all" (1984). E.g.: we want to model belief in the specific situation of a patient suffering from visual neglect in a lab experiment; this belongs to the set of situations of interest for this logic of belief.

Levesque's Logic of Implicit and Explicit Belief: The Works of it

Syntax: **L** is formed from a set of atomic sentences **P** using the standard connectives ∨, &, and ¬ (→ and ↔ are understood in terms of these), and the two unary connectives already known B and L.

Semantics: we use the Kripke structure $\langle S, \mathcal{B}, \mathcal{T}, \mathcal{F} \rangle$ where S is a set, $\mathcal{B}$ is a subset of S and $\mathcal{T}$ and $\mathcal{F}$ are functions from **P** to subsets of S. Intuitively, S is the set of all situations with $\mathcal{B}$ being those situations that could be the actual one according to what is believed. For any atomic sentence p, $\mathcal{T}(p)$ are the situations that support the truth of p, and $\mathcal{F}(p)$ are those that support the falsity of p.

To deal with the possible worlds compatible with a situation in a model structure, we define $\mathcal{W}$ by the following:

$\mathcal{W}(s) = \{s' \in S \mid$ for every $p \in$ **P**,

      a) s' is a member of exactly one of $\mathcal{T}(p)$ and $\mathcal{F}(p)$,

      b) if s is a member of $\mathcal{T}(p)$, then so is s',

and   c) if s is a member of $\mathcal{F}(p)$, then so is s'.}

For any set S^* of S, let $\mathcal{W}(S^*)$ mean the union of all $\mathcal{W}(s)$ for every s in S^*.

Levesque's Logic of Implicit and Explicit Belief (Cont.)

We can now define the support relations $\vDash_T$ and $\vDash_F$ between situations and formulas:

$\vDash_T$ and $\vDash_F \subseteq S$ are defined by:

1. $s \vDash_T p$ iff $s \in \mathcal{T}(p)$.

   $s \vDash_F p$ iff $s \in \mathcal{F}(p)$.

2. $s \vDash_T (\varphi \lor \psi)$ iff $s \vDash_T \varphi$ or $s \vDash_T \psi$.

   $s \vDash_F (\varphi \lor \psi)$ iff $s \vDash_F \varphi$ and $s \vDash_F \psi$.

3. $s \vDash_T (\varphi \,\&\, \psi)$ iff $s \vDash_T \varphi$ and $s \vDash_T \psi$.

   $s \vDash_F (\varphi \,\&\, \psi)$ iff $s \vDash_F \varphi$ or $s \vDash_F \psi$.

4. $s \vDash_T \neg\varphi$ iff $s \vDash_F \varphi$.

   $s \vDash_F \neg\varphi$ iff $s \vDash_T \varphi$.

5. **$s \vDash_T B\varphi$ iff for every s' in $\mathcal{B}$, $s' \vDash_T \varphi$.**

   $s \vDash_F B\varphi$ iff $s \nvDash_T B\varphi$.

6. **$s \vDash_T L\varphi$ iff for every s' in $\mathcal{W(B)}$, $s' \vDash_T \varphi$.**

   $s \vDash_F L\varphi$ iff $s \nvDash_T L\varphi$.

Levesque's Logic of Implicit and Explicit Belief: The Gain

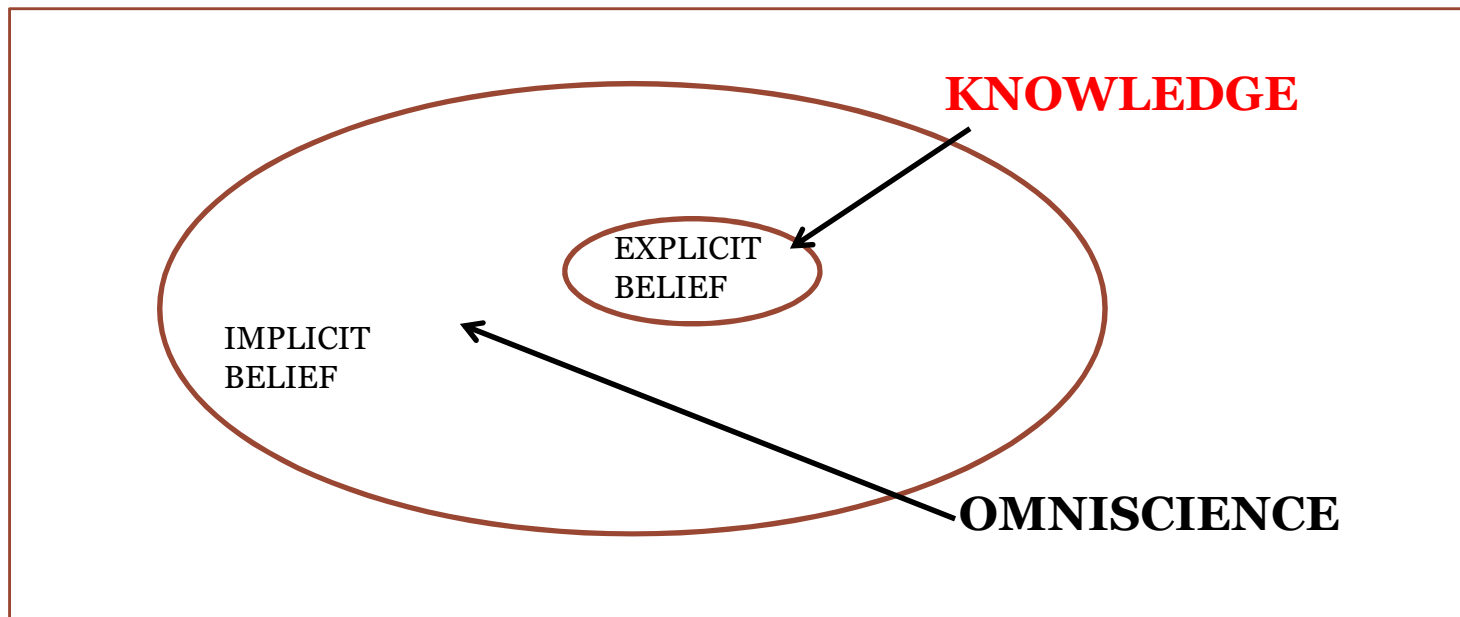Summarily (in terms of a proof theory), the appropriate axioms for implicit belief are:

1. $L\varphi$, where φ is a tautology.
2. $(B\varphi \rightarrow L\varphi)$.
3. $L\varphi \;\&\; L(\varphi \rightarrow \psi) \rightarrow L\psi$.

What we get from this logic is **"a semantically and computationally respectable notion of belief,"** namely as far as the highly controversial notion of **implicit belief** is concerned. However, among other shortcomings, Levesque's logic is and remains doxastic, i.e. it does not show how belief, explicit or implicit, can be knowledge. We have now to find a way to make of a logic of implicit and explicit belief an epistemic logic, without falling back into the epistemic logics characterized by the problem of logical omniscience (e.g.: Hintikka, 1962).
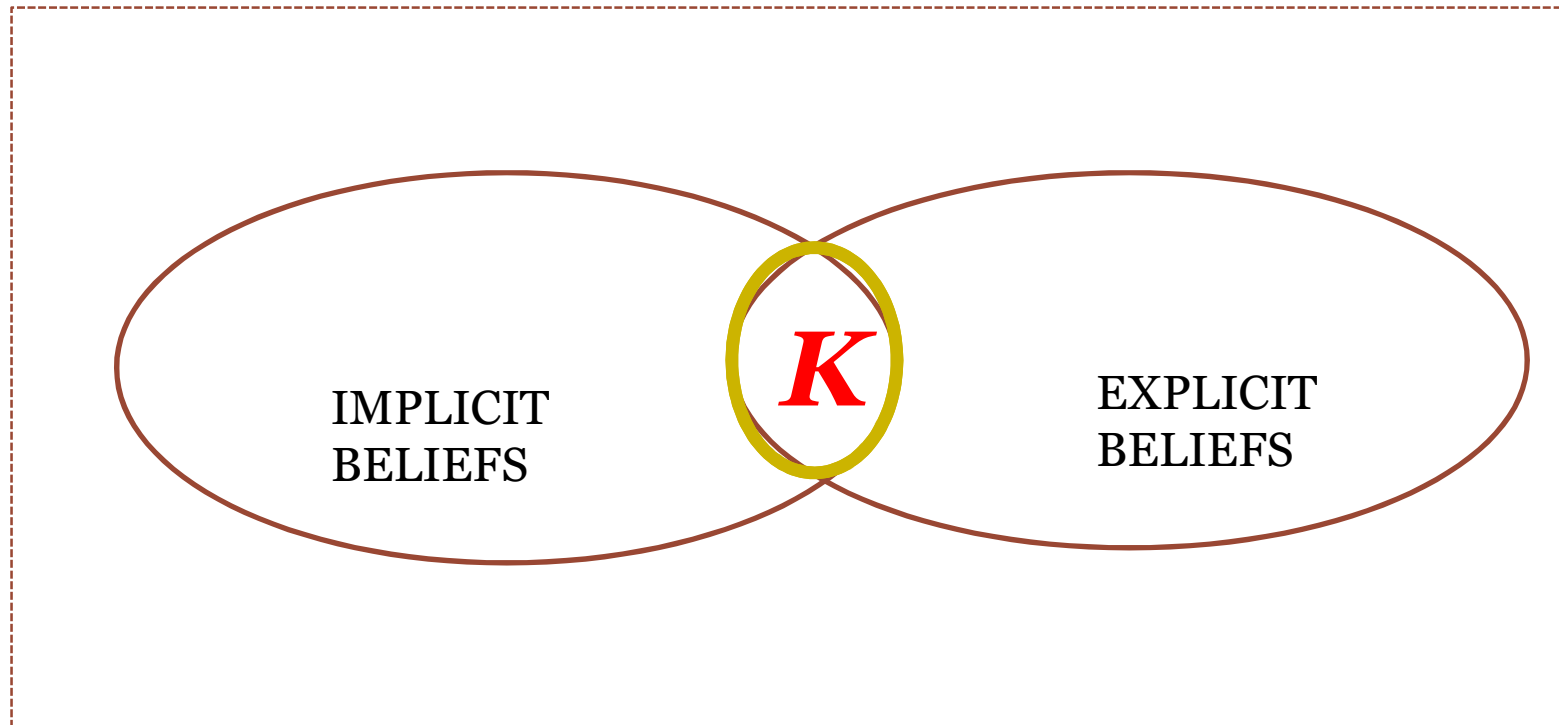
Knowledge & Belief

What Levesque's logic gives us is something like this:

Knowledge & Belief

When what we need is something like this:

A Logical System of **Knowledge** & **Explicit Belief**

Formally, it is perfectly feasible to combine an epistemic with a doxastic logic in which to express that knowledge is justified true *explicit* belief: we add the logic **S5** for knowledge to the doxastic logic **KD45**, i.e., to the strongest doxastic system consisting of system **K45** [which consists of **(a) any axiomatisation of propositional logic; (b) the axioms $B(\varphi \rightarrow \psi) \rightarrow (B\varphi \rightarrow B\psi)$, $B\varphi \rightarrow BB\varphi$, $\neg B\varphi \rightarrow B\neg B\varphi$; (c) the rules MP and N_B, i.e. $\varphi / B\varphi$**] 'strengthened' with the *deontic* axiom $\neg B(p \ \& \ \neg p)$ we add the epistemic logic **S5**, the strongest in the market, featuring the axioms $K(\varphi \rightarrow \psi) \rightarrow (K\varphi \rightarrow K\psi)$ (of **K**), $K\varphi \rightarrow \varphi$ (of **T**), $K\varphi \rightarrow KK\varphi$ (the *positive introspection axiom* of **S4**), and, finally, the *negative introspection axiom* $\neg K\varphi \rightarrow K\neg K\varphi$. The idea is, obviously, to add *connecting* axioms: $K\varphi \rightarrow B\varphi$ (Kraus & Lehman, 1986), which conveys the notion that knowledge is stronger than belief (i.e. knowledge is true belief!), and $B\varphi \rightarrow KB\varphi$ (*ibid.*), which expresses the notion that when a belief-holding subject has a belief that φ, then s/he knows that s/he believes that φ.

However, we still have to find a combined logical system in which we can express the epistemic fact that justified true *implicit* belief, too, is knowledge. To end this presentation, I advance some possible ways to accomplish this.

A Logical System of **Knowledge & Implicit Belief**

The first aspect to take into account in the case of a logic of knowledge in which implicit belief has a significant role is the **explicit ignorance** of the agent concerning its own knowledge; in other words, the agent does not know that it knows. Thus, we aim at reducing the accessibility relations of the model, given that "the more properties the accessibility relation is endowed with, the more access the agent has to [its] epistemic universe" (Hendricks & Symons, 2006). Evidently, this is system **T**, in which the accessibility relation is merely reflexive, allowing "ignorance sets" such as $\{K\varphi, \neg KK\varphi\}$.

However, this will not do for such a ***strong explicit ignorance*** as the one that unconscious beliefs yield: together with those above, we need the following sets to be satisfiable:

$$\{\varphi, K\varphi, \neg KK\varphi\}, \ \{\varphi, B\varphi, \neg BB\varphi\}, \{\varphi, B\varphi, \neg KB\varphi\}.$$

A Logical System of **Knowledge & Implicit Belief**

Moreover, in agreement with the notion of justification required for the analysis of knowledge that "puts the horse before the cart," we want an alethic logic that is rather a logic of epistemic justification: there has to be a "justification component" of the kind already introduced $t{:}p \rightarrow \Box p$. This requires a logic of proof of the kind elaborated by S. Artemov (1994) combined with a Hintikka-style epistemic modal logic.

A Logical System of **Knowledge & Implicit Belief**

But, unconscious knowledge is characterized precisely by the *availability* of *inaccessible* knowledge! We know that the more we reduce the accessibility relations, the 'weaker' an epistemic system we get; on the other hand, availability in epistemic logic seems to fatally lead to omniscience. Thus, the challenge might be the elaboration of an epistemic system where availability does not pose the problem of omniscience and the lack of epistemic accessibility is 'compensated' by epistemic availability.

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