

# Clarity and Objectivized Belief

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Barker and Taranto (2003) analyze *clear* as a vague predicate. Their account is based on belief: (1) is true iff the belief of the speaker and hearer in the truth of the proposition that Abby is a doctor is greater than some standard.

(1) It is clear that Abby is a doctor.

Barker (2007) argues that belief is inappropriate for an account of clarity. He points out that belief is not sufficient for clarity: both speaker and hearer may believe in the existence of God, yet still deny (2a); belief is not necessary either, because speaker and hearer might (perhaps irrationally) believe that there is life on Mars, yet assent to (2b).

(2) a. It is clear that God exists.

b. It is reasonably clear that Mars is barren of life.

Instead of belief, Barker suggests an account based on justification: (1) is true iff it is justified to conclude that Abby is a doctor. To formalize justification, Barker makes use of Kratzer's (1991) stereotypical ordering source (which is independent of belief), and proposes a function that maps worlds to degrees in a way compatible with this ordering source. Thus (1) is true iff in all worlds consistent with the evidence whose "degree of normality" is greater than some standard of skepticism, *d(clear)*, Abby is a doctor.

We agree with Barker's arguments against using subjective belief to explain clarity; nonetheless, there are at least two reasons why an account based on belief is attractive.

One reason has to do with expressions of personal clarity, for example:

(3) It is clear to X that Abby is a doctor (where X could be *me*, *you*, *John*, etc.).

What does it mean for some proposition to be clear to, say, the speaker, but not to the hearer? Barker (2007) suggests that this occurs when the speaker and the hearer have access to different evidence, or that they have a different standard of skepticism *d(clear)*.

However, we feel that this account does not do full justice to personal clarity. Consider a case where the same evidence is observed by both participants; for example, both Alex and Bill see a photograph of Abby wearing a stethoscope and smoking. Alex may conclude from the stethoscope that Abby is a doctor, while Bill may conclude from Abby's unhealthy behavior that she is not. The following exchange, then, is quite possible:

(4) Alex: It is clear to me that Abby is a doctor.

Bill: It is clear to me that she's not.

We assume that Alex and Bill share the same evidence, so this cannot explain their disagreement. The other option open to Barker is that they have different standards of skepticism, but this still won't do: if Bill is more skeptical than Alex, it means that Bill requires that Abby be a doctor in a superset of the worlds which are required by Alex; hence, the proposition that Abby is a doctor may not be clear to Bill, but its negation will not be clear to him either.

The exchange in (4), then, poses a problem for Barker. In contrast, an account in terms of belief is quite straightforward (cf. Barker and Taranto 2003): Alex and Bill reason in different ways, and come to believe different things on the basis of the same evidence.

Barker draws an analogy between personal clarity and what Lasersohn (2005) calls predicates of personal taste, as in:

(5) Alex: This chili is tasty

Bill: This chili isn't tasty.

But note that in such cases, what Alex and Bill disagree on is not merely the defining standard of the vague predicate *tasty*: "these predicates display vagueness... but that is a separate issue from the kind of apparent interpersonal variation in truth value that we have been concerned with" (Lasersohn 2005, p. 655). The differences between Alex and Bill may be formalized as

a difference between two sets of possible worlds (cf. MacFarlane 2006; Egan 2007), which lends itself quite naturally to an interpretation in terms of differences in belief.

The second reason why belief is an attractive choice for an account of clarity involves the different behaviors of *clear* and *clearly*. Piñón (2006) identifies three properties of modal adverbs that distinguish them from modal adjectives. Observing these cases, we note that *clearly* patterns with modal adverbs, while *clear* patterns with modal adjectives:

1. Modal adjectives can be negated, modal adverbs cannot:

- (6)  $\left\{ \begin{array}{l} \text{It's improbable that/ * Improbably} \\ \text{It's impossible that/ * Impossibly} \\ \text{It's unclear whether/ * Unclearly} \end{array} \right\} \text{ Abby is a doctor.}$

2. Modal adjectives, but not modal adverbs, can occur in the protasis of a conditional:

(7) a. If it's possible/probable/clear that Abby will be a doctor, then I, too, should apply to medical school.

b. \*If Abby will possibly/probably/clearly be a doctor, then I, too, should apply to medical school.

3. Modal adverbs, unlike modal adjectives, are not acceptable in questions:

(8) a. Is it possible/probable/clear that Abby is the best doctor in the hospital?

b. ?Is Abby possibly/probably/clearly the best doctor in the hospital?<sup>1</sup>

Piñón argues convincingly that these differences follow from the assumption that modal adverbs modify the strength of the speaker's belief in the assertion, rather than its content. Additional evidence comes from the distribution of overt indicators of illocutionary strength, e.g. *certainly* or *presumably* (cf. Krifka 2007): they preclude the use of modal adverbs, but not modal adjectives:

(9) a. Certainly/presumably it is possible/probable/clear that Abby is a doctor.

b. \*Certainly/presumably Abby is possibly/probably/clearly a doctor.

If the above arguments are granted, an account of *clearly* must make use of belief; and since the meaning of *clear* is obviously related to *clearly*, its meaning must involve belief too.

We therefore need a uniform account of both *clear* and *clearly*, which is based on belief, yet maintains the sense of objectivity of justification.

We formalize belief in terms of probability. Specifically, we use Halpern's (1990) logic of probability, which includes arithmetic operators. We assume, for each believer *i*, a discrete probability function over possible worlds, *f<sub>i</sub>*. We introduce into the logic distinguished propositional functions *P<sub>i</sub>*, such that the intended meaning of *P<sub>i</sub>(φ)* is the subjective probability of *φ* according to *i*. Formally, for any proposition *φ*, modal base *W*, model *M*, world *w* and assignment function *v*:

$$(10) [[P_i(\phi)]]^{M,w,v} = f_i(\{w \in W \mid (M,w,v) \models \phi\})$$

Belief in *φ*, then, is the probability of *φ* over an epistemic modal base; *P* without any subscript defaults to the probability according to the speaker.

We propose an assertion operator *Δ*, with two arguments: the content of the asserted proposition and its degree of strength. For example, the content of the assertion of (11a) is that Abby is a doctor, and the strength is some default degree of belief, which we take to be “at least **high**”. This is expressed formally in (11b):

(11) a. Abby is a doctor.

b. *Δ* (**doctor(a)**, *P*(**doctor(a)**) ≥ **high**)

The logical form of (3) is (12), which expresses the statement that *X* believes to a degree of at least *d*(**clear**) that Abby is a doctor, and the speaker believes to a high degree that *X* believes to a degree of at least *d*(**clear**) that Abby is a doctor.

$$(12) \Delta(P_x(\mathbf{doctor(a)}) \geq d(\mathbf{clear}), P(P_x(\mathbf{doctor(a)}) \geq d(\mathbf{clear})) \geq \mathbf{high})$$

<sup>1</sup> Sentences like (8b) are considered ungrammatical by Piñón, though others (including an anonymous reviewer) may accept them. But we think it is safe to say that *clearly* gets the same grammaticality judgments as other modal adverbs.

Regarding non-personal clarity, the idea is that a speaker who utters (1) or (2) is saying that people with sound judgment would come to believe, on the basis of the available evidence, that Abby is a doctor, God exists, or Mars is barren of life. We formalize this idea by defining a probability function over the judgments of possible individual reasoners. Each individual reasoner  $1 \leq i \leq n$  is assigned a weight,  $w_i$ , indicating how good a reasoner he or she is; we define  $P_{\text{justification}}$  to be the weighted sum of these individual probabilities:

$$(13) \quad P_{\text{justification}}(\varphi) =_{\text{def}} \sum_{i=1}^n w_i P_i(\varphi)$$

If the sum of all weights is 1, it is easy to see that  $P_{\text{justification}}$  is a probability function.

Thus, the assertion of (1) is represented as follows:

$$(14) \quad \mathbb{A}(P_{\text{justification}}(\text{doctor}(\mathbf{a})) \geq d(\text{clear}), P(P_{\text{justification}}(\text{doctor}(\mathbf{a})) \geq d(\text{clear})) \geq \text{high})$$

This formula means that it is justified to conclude that Abby is a doctor, and the speaker believes to a high degree that it is justified to conclude that Abby is a doctor.

Following Piñón, *clearly* modifies the strength, rather than content, of the assertion. Hence, the representation of (15a) is (15b):

- (15) a. Abby is clearly a doctor.  
b.  $\mathbb{A}((\text{doctor}(\mathbf{a}), P_{\text{justification}}(\text{doctor}(\mathbf{a})) \geq d(\text{clear}))$

This means that Abby is a doctor, and it is justified to conclude that Abby is a doctor.

It is often claimed that a vague phenomenal quality, such as *red*, is defined by collective judgments of good observers. For example: "For an object to be (definitely) red is for it to be the case that the opinion of each of a sufficient number of competent and attentive subjects...would be that it was red." (Wright 1987, p. 244). Our approach can be seen as a way to apply this intuition to the case of clarity, where we consider good reasoners rather than good observers. Our view of justification as "objectivized" belief provides a uniform account of clarity, both personal and non-personal, both adjectival and adverbial.

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