

Incredulity Questions

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Abstract

Incredulity questions have a double nature: on the one hand, they are questions, while, on the other hand, they are statements of incredulity or indignation. Hence, a multidimensional account of their interpretation is attractive. Artstein (2002) proposes a multidimensional account of a similar phenomenon—echo questions. He argues that the expression that is questioned is focused, and, using Rooth’s (1985; 1992) alternative semantics, suggests that the interpretation of the echo question is its focus semantic value.

While similar, incredulity questions differ from echo questions in both form and meaning. They have a different intonation pattern, where incredulity is expressed by expanded pitch range, rather than by focus. Incredulity questions also have a different interpretation: they are not used to recover some information that was misheard or misunderstood, but to express incredulity or indignation about a statement that was heard and understood perfectly. Yet, Artstein’s approach can be extended to handle incredulity questions, if, instead of the focus semantic value, we use a new semantic value, the *world semantic value*, which considers alternative possible worlds. Thus, an incredulity question expresses the claim that in none of the speaker’s belief (or normative) worlds is the echoed statement true—hence the incredulity (or indignation) expressed toward that statement.

1 Introduction

Suppose Bill hears Ann uttering (1.a); in response, Bill utters (1.b) or (1.c) (capitals indicate pitch accent—the interpretation of this pitch accent will be discussed momentarily).

- (1) a. John is going to get the job.
- b. B: JOHN is going to get the job?!
- c. B: WHO is going to get the job?!

How are we to interpret Bill’s utterances?

On the one hand, they look like questions—specifically, echo questions. Bill’s utterances end with rising intonation, and they can get the same sort of answer that a genuine question would elicit. Thus, “yes” and “John” are possible (though perhaps not very helpful) responses to (1.b) and (1.c), respectively.

On the other hand, however, Bill’s utterances are not genuine questions. Bill is not seeking information; we can safely assume that Bill understood what Ann was saying. The point of Bill’s utterances is to express incredulity. Bill does not question the fact that John will, indeed, get the job, but expresses surprise—this is not at all what Bill expected, so much so that it is hard for Bill to believe it. For instance, Bill may believe that John is an extremely unsuitable choice, so that his appointment is incredible. Bill may also express indignation: he may be interpreted as saying that John’s appointment is bad, unethical, unjust, or the like. For example, Bill may have received a promise to get the job himself, and John’s appointment breaks this promise.

Note that when Ann responds, she may, and usually will, relate to the incredulity or indignation aspects of Bill’s utterance, rather than treat it as a question. Thus, it would be quite felicitous of her to offer some sort of explanation or justification, as in (2.a) or (2.b):

- (2) a. John is actually a good choice, but he never got a chance to show his true ability.
- b. I am sorry, I know I promised you the job, but the big boss forced me to appoint John.

This dual aspect of incredulity questions is demonstrated nicely in the following excerpt from *Sointula*, by Bill Gaston:

“I . . . want to be rid of this whiskey before I tackle the West Coast Trail.”

“YOU’RE doing the trail?”

Gore sees Bob scan his body while asking this and he hears incredulity in the question.

“Yes.” He pauses. “Why?” (p. 92)

When Gore says “yes”, he is answering the question aspect of Bob’s utterance; when he asks “why?”, he is questioning why Bob is expressing incredulity.

So, incredulity questions, like (1.b) and (1.c), have aspects of a question, and also aspects of an assertion (or, perhaps, an expressive). An understanding of incredulity questions, therefore, is important from a theoretical point of view, in that it combines with an increasing body of work on constructions that can express more than one meaning simultaneously, and provides clues to their proper treatment.¹

The study of incredulity questions is also important from a practical-computational point of view. Clearly, a question answering system needs to respond to an incredulity question differently from the way it responds to a genuine question: to provide helpful feedback to the

user, the system should supply some justification or explanation (Carberry 1989; Lambert and Carberry 1991; Chin 2000). Consider, for example, the following exchange from a system that helps students register for courses (Lambert and Carberry 1991):

(3) **User:** When does CS400 meet?

System: CS400 meets on Mondays, 7–9p.m.

User: CS400 meets at night?

The user’s second utterance is clearly an incredulity question. The user seeks some explanation for why the course is taught at such an unusual time. A simple answer of “yes” would clearly be inappropriate; what the user really wants is some sort of explanation or justification for this surprising fact.

In this paper I provide a semantics of incredulity questions, which is compatible with their double nature. I explain why they look like questions, yet can be interpreted as assertions, and how their interpretation is related to their intonation.

The rest of the paper is organized as follows. In section 2 it is argued that the double nature of incredulity questions calls for a multidimensional approach. In section 3 I discuss a multidimensional approach to a related phenomenon—echo questions. Section 4 argues that the crucial element of a multidimensional theory of incredulity question consists of referring to alternative possible worlds. Section 5 formalizes this idea, and section 6 demonstrates how the formalization accounts for the properties of incredulity questions.

2 A Multidimensional Theory

Since incredulity questions have a dual aspect, it makes sense to account for them with a multidimensional theory: a theory according to which an expression may have more than one semantic value.

Asher and Reese (2005) propose such a theory. They assign to incredulity questions a

¹See Potts (to appear) for a recent discussion.

complex semantic type: *question • assertion*. Taking the standard view (Hamblin 1973) that the meaning of a question is the set of its potential answers C , Asher and Reese take the assertion to be the claim that one of these answers is unexpected:

$$(4) \quad \exists p(p \in C \wedge \mathbf{Expect}\neg p)$$

Pragmatics then makes sure that the previously mentioned answer is selected as unexpected. Thus, (1.b) and (1.c) are questions, but they are also assertions that one of their potential answers, namely (1.a), is unexpected.²

I think this view, according to which the incredulity aspect is related to the question aspect, is essentially correct. In this paper, I suggest a way of deriving this interpretation from more general principles.

3 Echo Questions

Incredulity questions are often treated as a kind of echo questions, because they share many syntactic properties (Authier 1993). Looking at the semantics of echo question may therefore help us figure out the meaning of incredulity questions.

Artstein (2002) proposes a theory of echo questions that is particularly attractive for our purposes, because it is multidimensional at a fundamental level. Specifically, Artstein follows *alternative semantics* (Rooth 1985; 1992). Rooth argues that every expression ϕ has two semantic values: in addition to the ordinary semantic value, $\llbracket \phi \rrbracket^O$, ϕ also has a *focus semantic value*, $\llbracket \phi \rrbracket^F$, which is a set of alternatives to the focused element(s) of ϕ .

²To be precise, Asher and Reese only treat incredulity *assertions*, such as:

- (i) a. A: I'd like you here tomorrow morning at eleven.
- b. B: !Eleven in the morning!

They do, however, treat other complex type questions in a similar way, so I believe the above is a faithful presentation of their view.

According to Artstein, echo questions have a distinctive contour with a rising pitch accent (L+H* in the notation of Pierrehumbert 1980), and a high-rising boundary (HH%). He argues that this pitch accent is an instance of focus; one of the reasons for this claim is that, just like focus, echo questions can appear on parts of words:

- (5) a. She believes in WHAT-jacency?
- b. John witnessed a great reve-WHAT-tion?
- c. Bill is a WHAT-dontist?

Thus, the focus semantic value of (1.b) will be a set of alternative propositions of the form:

- (6) {John is going to get the job,
 Mary is going to get the job,
 Julie is going to get the job,
 ... }

This set of alternatives corresponds to a question inquiring which of these alternative propositions was asserted.³

Sentence (1.c) looks like a *wh*-question; however, Artstein argues that it is not a genuine question, because such sentences do not obey locality restrictions. Instead, he argues that the *wh*-word is focused, and the interpretation of (1.c) is its focus semantic value; which is the same as that of (1.b). Thus, (1.b) and (1.c) have the same semantics (though they may have different pragmatics).

Artstein can therefore account for the question aspect of an echo question: it is used when one interlocutor failed to understand or hear clearly what the other one is saying. Thus, if we interpret Bill's utterances in (1.b) or (1.c) as echo questions, the implication is that he did not hear clearly, and is seeking confirmation about the identity of the person who will get the job.

³Of course, one ought to be more precise, and replace these glosses with whatever one's favorite theory says that the semantic value of propositions is. I will return to this issue in section 6 below.

Artstein acknowledges that, in addition to clarification-seeking echo questions, there are also cases where an echo question is used to express incredulity or indignation about some proposition, usually the previous utterance or an entailment of it. However, he does not explain how these particular aspects of the meaning follow from his system: how does it follow that if Bill is inquiring about the identity of the person who got the job, then Bill knows it is John, but expresses incredulity or indignation about the fact?

Moreover, incredulity questions differ in their intonation from pure echo questions. In fact, they have a tune similar to that of ordinary declaratives, except that, being questions, they have a final rise rather than a final fall (Moulton 1987). The meaning of incredulity is expressed not through the tune, but via an expanded pitch range (Hirschberg and Ward 1992; Herman 1996; Jun and Oh 1996; Lee 2005). Another difference is that incredulity questions cannot apply to parts of words: the utterances in (5) above do not have an incredulity or indignation interpretation.

Thus, while for echo questions a case can be made that the pitch accent is associated with focus, an analogous case for incredulity questions would be hard to make. Nonetheless, I believe that Artstein’s insight, namely that incredulity questions, just like echo questions, involve reference to a set of alternatives, is correct. In the next section I propose an extension of his multidimensional approach, which can handle the meaning of incredulity questions.

4 Considering Alternative Worlds

So, when Bill utters (1.b) or (1.c), his utterance invokes a set of alternatives. But alternatives to what? Clearly, the alternatives have something to do with John; but Bill is not considering alternative candidates for the job, because he heard and understood that John is the one.

One may suggest that Bill *is* considering

alternative candidates for the job, but his utterance is a rhetorical, rather than a genuine question, since he already knows the answer. But this will not do. Normally, a rhetorical *wh*-question is interpreted as implying that the answer is the empty set.⁴ For example:

- (7) a. Who believes such nonsense?
(Bolinger 1957:158)
- b. When has he ever said a word against his mother? (Horn 1978:151)
- c. What difference does it make?
(Quirk *et al.* 1985:826)

The rhetorical question in (7.a) implies that nobody believes such nonsense, (7.b) implies that he has never spoken against his mother, and (7.c) implies that it makes no difference.⁵

So Bill’s question does not involve alternative candidates for the job. Instead, I suggest that Bill is considering alternative worlds. The incredulity or indignation interpretations are then generated as follows.

The identity of the alternative worlds depends on the modal base (which, in turn, is dependent on the context). The modal base can be doxastic, i.e. the alternative worlds are Bill’s belief worlds: in each one of these worlds, some candidate is getting the job. Bill is then asking us to find a world among them in which John gets the job. This is a rhetorical question, because Bill already knows the answer—he hardly needs us to tell him what’s in his belief worlds!

Therefore, when Bill is asking about his belief worlds, he is implying that the answer is the

⁴I am using the neutral term “implying”, since it is not relevant to our discussion here whether this is an entailment, a presupposition, or an implicature.

⁵There are well known exceptions to this generalization, such as (i), as said by a mother to her son, which clearly expects the answer “mother”.

- (i) Who fed you and gave you a proper education?
(Han 2002:218, note 6)

But even in such cases, the implication is that nobody *besides* the addressee’s mother is a true answer to the question. But this is not the point of (1.b) or (1.c); Bill is not drawing attention to the fact that nobody else is going to get the job, but expresses his incredulity or outrage at John’s getting it.

empty set: i.e. in none of his belief worlds does John get the job. Hence, his getting the job is incredible. Of course, we are concerned here with Bill’s belief worlds *before* Ann spoke; after he heard Ann and accepted what she said, Bill’s belief worlds will obviously contain the fact that John will get the job.

Alternatively, the modal base may be deontic. In this case, Bill refers to worlds that are permissible, given his norms. Once again, this is interpreted as a rhetorical question, since Bill’s norms are obviously known to himself. Therefore, Bill is implying that in none of these worlds does John get the job. This is how the indignation interpretation is generated: the appointment of John to the job constitutes a violation of Bill’s norms of conduct.

The focus semantic value is not able to generate this reading. But a different sort of semantic value might.⁶ We need a semantic value that can model expectations (and their violation), by taking into account possible worlds.

5 World Semantic Value

At this point, it would be a good idea to consider a different phenomenon where expectation is important. One such case is the interpretation of *many*.

It is well known that *many* is vague: there are no clear criteria for how many is many. Consider (8.a), for example, whose logical form is something like (8.b).

- (8) a. Many academics watched the 2006 World Cup.
 b. **many(academic, watch-WC)**

Sentence (8.a) would be true iff the proportion of academics who watched the 2006 World Cup is higher than some threshold. That is to say, it would be true iff

$$(9) \quad \frac{\|\mathbf{academic}\| \cap \|\mathbf{watch-WC}\|}{\|\mathbf{academic}\|} > \rho,$$

⁶For proposals involving other semantic values, in addition to Rooth’s focus semantic value, see Büring (1997; 1999) and Cohen (to appear).

for some parameter ρ .⁷ The question is, then: what is the value of this threshold ρ ?

In a well known paper, Fernando and Kamp (1996) propose to solve this problem as follows. They suggest that **many**(ψ, ϕ) is true iff it could well have been the case that fewer ψ s are ϕ s. In other words, there are more ψ s that are ϕ s than expected. For example, (8.a) means that more academics watched the 2006 World Cup than one would expect of academics. Fernando and Kamp formalize this notion of expectation using probabilities over possible worlds.

Cohen (to appear) provides a multidimensional account of Fernando and Kamp’s proposal by proposing a new type of semantic value: *world semantic value*, $\llbracket \phi \rrbracket^W$, which takes into account alternatives to the world of evaluation of ϕ . $\llbracket \phi \rrbracket^W$ is a set: each member of the set is the ordinary semantic value of ϕ in some world. For example, if ϕ is a property, $\llbracket \phi \rrbracket^W$ is a set of sets of individuals. Every member of $\llbracket \phi \rrbracket^W$ is a set of individuals that are in the extension of ϕ in some world.

Can these sets overlap? There are reasons to believe that the answer is no. Von Stechow (1997, note 2) argues for using Lewis’s (1968, 1971, 1986) *counterpart theory* in accounts of natural language quantification. If that is so, then the individuals in different worlds are different. Hence, the sets that are members of $\llbracket \phi \rrbracket^W$ are disjoint.

If we then apply union to the world semantic value of the property, $\bigcup \llbracket \phi \rrbracket^W$, we get the set of all individuals that are in the extension of ϕ in some world.

In the case of (8), the union of the world semantic value of the restrictor, $\bigcup \llbracket \mathbf{academic} \rrbracket^W$, is the set of possible academics, i.e. individuals who are academics in some world. The union of the world semantic value of the scope, $\bigcup \llbracket \mathbf{watch-WC} \rrbracket^W$, is the set of individuals who watched the 2006 World Cup in some world.

⁷As is well known, (8.a) also has a reading where the absolute number of academics who watched the 2006 World Cup, rather than the proportion, is considered, and probably other readings as well. The ambiguity of *many*, however, does not concern us here.

Now consider the probability that something is a ϕ in some world, given that it is a ψ in some world:

$$(10) \quad P(\cup \llbracket \phi \rrbracket^W | \cup \llbracket \psi \rrbracket^W)$$

Since individuals in different worlds are different, (10) is the probability that if an individual in some world is a ψ , then it is a ϕ . This is precisely the expectation that a ψ is a ϕ , required by Fernando and Kamp's theory. **many**(ψ, ϕ) is true, then, just in case the proportion of ψ s that are ϕ s is greater than this expectation:

$$(11) \quad \frac{|\llbracket \psi \rrbracket \cap \llbracket \phi \rrbracket|}{|\llbracket \psi \rrbracket|} > P(\cup \llbracket \phi \rrbracket^W | \cup \llbracket \psi \rrbracket^W).$$

In the case of (8), the threshold is the probability

$$(12) \quad P(\cup \llbracket \text{watch-WC} \rrbracket^W | \cup \llbracket \text{academic} \rrbracket^W)$$

This is the probability that someone who is an academic in some world, watched the 2006 World Cup in that world.

Thus, (8) is true iff the proportion of academics who watched the 2006 World Cup is higher than the expectation that an academic watched the 2006 World Cup:

$$(13) \quad \frac{|\llbracket \text{academic} \rrbracket \cap \llbracket \text{watch-WC} \rrbracket|}{|\llbracket \text{academic} \rrbracket|} > P(\cup \llbracket \text{watch-WC} \rrbracket^W | \cup \llbracket \text{academic} \rrbracket^W)$$

These appear to be the correct truth conditions.

6 Tying It All Together

We now have everything in place to account for incredulity questions. Consider (1.b). The expanded pitch range is used to indicate that the world semantic value of *John* ought to be considered. This is the set of counterparts to John in each one of Bill's belief (or normative) worlds:

$$(14) \quad \{\text{John}_{w_1}, \text{John}_{w_2}, \text{John}_{w_3}, \dots\}.$$

How do we combine the world semantic value of *John* with the other elements of the sentence? We can follow the same procedure as the one used for computing the focus semantic value. Rooth (1985; 1992) suggests that the focus semantic value of an expression is computed compositionally, using the ordinary semantic rules to combine the focus semantic values of its parts.⁸

Thus, the world semantic value of (1.b) can be glossed as (15).

$$(15) \quad \{\text{John}_{w_1} \text{ is going to get the job,} \\ \text{John}_{w_2} \text{ is going to get the job,} \\ \text{John}_{w_3} \text{ is going to get the job,} \\ \dots\}$$

This is merely a gloss; to make it precise, one needs to replace the set of English sentences with a set of propositions. But we need to be careful: when we consider the world semantic value of a proposition, it makes little sense to take propositions to be sets of possible worlds, since possible worlds are precisely what we are abstracting away from. In the case of (15), we will get the undesirable result that each member of the world semantic value is either a singleton set $\{w_i\}$, if John_{w_i} is going to get the job, or the empty set, if John_{w_i} is not going to get the job.

But recall that we are using counterpart theory. In this theory, there are independent reasons for not treating propositions as sets of possible worlds (Dorr 2005). Instead, we ought to use some form of *structured propositions*. Indeed, Lewis (1986) himself suggests such a representation. Thus, the proposition expressed by "*a is P*" is an ordered pair $\langle a, P' \rangle$, where P' is the set of all individuals, in all worlds, that have the property P .⁹ This proposition is then true iff the first element in the pair is a member of the second: $a \in P'$.

For example, the proposition expressed by (16.a) is (16.b), and is true iff John is one of

⁸Though see Cohen (1999) for some problems with this view.

⁹So, in effect, $P' = \cup \llbracket P \rrbracket^W$.

the individuals that are going to get the job in some world. Since every individual can occur in one world only, this is equivalent to (16.c), and is true iff John (in the world of evaluation) is going to get the job, as desired.

- (16) a. John is going to get the job.
 b. $\langle \text{John}, \{x | x \text{ is going to get the job in some world} \} \rangle$
 c. $\langle \text{John}, \{x | x \text{ is going to get the job} \} \rangle$

Applying this view of propositions, the resulting world semantic value of (1.b) is a set of propositions of the form:

- (17) $\{ \langle \text{John}_{w_1}, \{x | x \text{ is going to get the job} \} \rangle, \langle \text{John}_{w_2}, \{x | x \text{ is going to get the job} \} \rangle, \langle \text{John}_{w_3}, \{x | x \text{ is going to get the job} \} \rangle, \dots \}$

What Bill is actually asking, then, is this: in which world (among my doxastic/deontic alternatives) is John going to get the job? This is a rhetorical question: Bill knows better than anyone else what happens in his belief or normative worlds. Hence, it is taken to be a question that implies that none of its possible answers is correct. Therefore, Bill is implying that (prior to Ann’s utterance) in none of his belief worlds does John get the job (which is why he is incredulous), or that in none of his normative worlds does John get the job (which is why he is indignant). Again, it is important to emphasize that the rhetorical question is about Bill’s belief/normative worlds, not about the identity of the person who is going to get the job.

Following Artstein (2002), the meaning of a *wh* incredulity question like (1.c) is the same. The utterance does not receive a normal question meaning; instead, the world semantic value of the *wh*-word is used, just like in the case of a non-*wh* incredulity question. Indeed, the responses in (2) are felicitous answers to both (1.b) and (1.c). Of course, Ann might choose to treat Bill’s utterance as a normal question, rather than an incredulity question; in this case, the

appropriate responses would differ: “yes” for (1.b), and “John” for (1.c).

Thus, an incredulity question has a dual aspect. On the one hand, it really is a question: Bill is asking in which world John is going to get the job. If Ann answers *yes* to (1.b) or *John* to (1.c), she is indicating such a world—the actual world (though this world may not be among Bill’s belief or normative worlds). On the other hand, it is a statement of incredulity or indignation: by being rhetorical, the question implies that none of the possible answers are true, i.e. that the echoed statement is incredible or outrageous.

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