

Inquisitive assertions and nonveridicality

Anastasia Giannakidou*

University of Chicago, Chicago USA
giannaki@uchicago.edu

Abstract

In this brief note, I discuss how basic is, in natural language, the distinction between an assertion and a question. The question is currently debated within inquisitive semantics [14]; [1];[2]) and in addressing it, I look at sentences with modal verbs, questions, and disjunctions. These seem to form a natural class in terms of conveying epistemic states that allow p and $\neg p$, they are therefore nonveridical ([6]; [7]; [25]). Given that allowing p and $\neg p$ is also the hallmark of inquisitive sentences (questions), we can think of nonveridical assertions as 'inquisitive assertions'. So, if we take (non)veridicality into consideration, the distinction between assertion and question is not categorical: assertions do not form a natural class, and nonveridical assertions pattern epistemically with questions. This means that the difference between questions and assertions as a division of labor between informativity and inquisitiveness cannot be categorical either. These conclusions support the original tenet of inquisitive semantics that meaning is semantically non-dichotomous. I also include discussion of the difference between questions on the one hand, and universal modal assertions on the other. I argue that the former convey a true nonveridical equilibrium between p and $\neg p$, whereas universal modal assertions have bias towards p . This bias creates partial informativity in universal modal assertions— and when present, in questions.

Contents

1	Questions and assertions in inquisitive semantics	1
2	(Non)veridicality: homogenous and partitioned information states	3
3	Modality and bias	8
4	Inquisitiveness, (non)veridicality, and (non)homogeneity	10

1 Questions and assertions in inquisitive semantics

In language, it is common to distinguish between questions (interrogative sentences, here considering only polar questions) and assertions (declarative sentences) syntactically. This may

*It is such a unique and happy occasion to write this paper in honor of Jeroen Groenendijk, Martin Stokhof, and Frank Veltman. Thank you, Floris and Maria, for inviting me to contribute. And thank you, Jason Merchant, for your comments and suggestions. I spent two years at the ILLC, my first job out of graduate school in 1997-1999, and I remember those years as a period of enormous learning and real human warmth. This paper is meant as a big thank you to the three of them, and I thought of a topic that covers areas of interest (inquisitiveness, questions, modality) that they share. To Jeroen and Martin in particular, I owe a big thanks for making the ILLC such a welcoming place for me, for supporting my initiatives and reading groups while I was there, and for guiding me through that very decisive period in my life. Jeroen was an exceptional mentor, I learnt a lot from him, and I always remember him very fondly. It seems like yesterday, though it was some time ago. *Hartelijk dank voor alles!*

be done with intonational or syntactic means, e.g. *Did Ariadne eat breakfast?* vs. *Ariadne ate breakfast*; languages may also employ question markers (e.g. East Asian languages, some Slavic languages, etc.). Declarative sentences and questions also differ in their discourse function: the former are claimed to provide information, while interrogative sentences are typically used as requests for information. Most formal semantic analyses assume a logical language that reflects those differences in having a clear syntactic distinction between declaratives and interrogatives, often containing a designated speech act operator such as ? or ASSERT. Ciardelli et al. call those analyses *syntactically dichotomous*, and usually, such analyses are also *semantically dichotomous* in assigning different semantic values to questions and assertions.

A clear example of dichotomous approach is the partition semantics of [13], where a logical language is assumed to contain sentences of the form ? p (interrogative), and ! p (declarative), and every sentence in the language is either declarative or interrogative. The system is thus syntactically dichotomous; it is also semantically dichotomous in that declarative and interrogative sentences denote different semantic objects. Declaratives denote *propositions* (sets of worlds): in uttering *Ariadne ate breakfast* the speaker provides information that the actual world is located in the p region given by *Ariadne ate breakfast*. But interrogatives denote questions in the technical sense: i.e. equivalence relations over the set of possible worlds. A polar question *Did Ariadne eat breakfast?* partitions the worlds into worlds where Ariadne ate breakfast and worlds where she did not, and the speaker asks for information about which partition to place the actual world in.

These quite popular distinctions are currently re-thought in the light of *inquisitive semantics*. Groenendijk originally envisioned a logical system where sentences are not distinguished syntactically as declaratives or interrogatives, and where sentences have both inquisitive and informative content. In a recent paper [2], which I will be referring to here as Ciardelli et al, they compare what they call the basic version InqB (the non-dichotomous system) to InqD, an inquisitive logic that is syntactically dichotomous. The comparison shows that “even though inquisitive semantics, as a general approach to meaning, does not require a clearcut syntactic distinction between declaratives and interrogatives, it is perfectly compatible with such a distinction.” And, as Jeroen Groenendijk in a presentation at the Nantes workshop on alternatives in 2010 emphasized, it remains to be seen whether the logic of natural language is InqB or InqD, or either of the two at all.

My goal in this article is to show that there are indeed reasons to keep interrogatives and declaratives as distinct semantic objects: negative polarity item licensing clearly suggests that, as we will see below. But there are also reasons to think of some assertions—in particular the nonveridical ones such as disjunctions and assertions with modals—as a natural class with inquisitive sentences. Nonveridical assertions are informationally weaker than past or present assertions, and convey partitioned, non-homogenous epistemic states, just like questions, supporting both p and $\neg p$ (as I have been arguing in a number of works). Disjunctions, despite the fact that they are assertions, also present a choice, albeit not a polar one. Irrespective of the syntactic distinction, I will argue, between an assertion and an interrogative, the option of between a partitioned or a non-partitioned epistemic domain is what lies at the core of the semantics in both assertions and non-assertions (thus also in imperatives, exclamatives, and other speech acts).

Semantically, in InqD, all sentences are assigned the same type of meanings, capturing both their informative and their inquisitive content. However, the division of labor between inquisitiveness and informativity is argued to be categorical: in the case of declarative sentences, inquisitive content will always be trivial, while in the case of interrogative sentences, informative content will always be trivial ([2]):

- (1) Inquisitiveness and Informativity
 - a. A question $?p$ has trivial informative content.
 - b. An assertion $Assert p$ has trivial inquisitive content.

Thus, “even though the system is not semantically dichotomous in the strict sense of the term, it does clearly capture the crucial semantic difference between declaratives and interrogatives” ([2]). One of the consequences of my discussion here is that because of (non)veridicality, the division of labor between informativity and inquisitiveness cannot be categorical.

To see the connection with nonveridicality, consider the following fact, from [2]:

- (2) Fact 2 (Inquisitiveness in terms of possibilities)
 - p is inquisitive iff there are at least two possibilities for p .
 - p is an assertion iff there there is exactly one possibility for p .

In other words, an inquisitive sentence $?p$ expresses a partitioned epistemic state (two possibilities for p) but an assertion of p comes only with one possibility: p . This is true, however, only for veridical, i.e. past and present assertions. Nonveridical assertions, on the other hand, as I show next, also come with two possibilities and so they need to be thought of as inquisitive, under Fact 2. So, if we take veridicality into consideration, the difference between questions and assertions cannot be categorical, since assertions do not form a uniform class. Questions, by the way, are also not uniform: biased questions, as I discuss briefly in section 3, do convey non-trivial informative content. The program of inquisitive semantics is still in its beginning, and it is therefore worthwhile to think as broadly as possible about its potential, direction, and empirical scope. My comments in this paper are intended in this spirit, as an inquiry into the basic premises. Nonveridicality allows us to see that the distinction between assertion and question is not as basic as we thought—and this seems to support the original approach to inquisitive meaning as semantically non-dichotomous.

2 (Non)veridicality: homogenous and partitioned information states

I will start with one striking similarity between questions and modalized assertions, observed in many languages: they both license limited distribution expressions such as negative polarity items (NPIs) and free choice items (FCIs). In this, they contrast with past or present assertions, which block these items:¹

- (3)
 - a. Did Ariadne eat any cookies?
 - b. At the party, Ariadne may/can talk to anybody.
 - c. Any student can solve this problem.
 - d. Ariadne didn’t eat any cookies.
- (4)
 - a. *Ariadne ate any cookies.
 - b. *Ariadne is eating any cookies right now.

In my dissertation and a number of papers before ([4],[5],[6]; [9]), I suggested that the key to understanding this difference is nonveridicality (see also [25]). NPIs are licensed in nonveridical

¹I give here examples in English; languages distinguish empirically between NPIs and FCIs, and both appear in the contexts above; see [6],[7],[8],[9]. Giannakidou 2011 argues that English *any*, which has one of the most complicated distributions, cross-linguistically, is an NPI with the FCI implicature, which is suppressed in negative contexts and questions.

contexts. Positive assertions are veridical and block NPIs and FCIs; but questions are non-veridical because there is a choice between p and $not\ p$ ([6];[7]), hence the NPI pattern we observe. Accounts of NPIs based on downward entailment or negation have trouble with both the licensing of NPIs in questions—because questions are not downward entailing or negative—and the similarity of questions to nonveridical modal assertions. So, the pattern of NPIs above necessitates a split within the assertion class, between assertions that license NPIs (and thus pattern with questions), and those that don’t.

So, what is veridicality? Veridicality is a semantic property of any expression that entails the truth of its argument ([25],[4],[6],[7],[8]):²

(5) *Objective* veridicality: A function F is veridical iff Fp entails p .

This notion of objective veridicality is equivalent to factivity, but is challenged when we consider modality, negative polarity, and mood choice, as I showed in earlier and more recent work on mood and modality (part of it in collaboration with Alda Mari). I will not bother the reader here with citations and details, but offer a quick summary of what I have said. I argued that a subjective version of (non)veridicality is necessary, one that allows veridicality to depend on what epistemic agents know or believe to be true. I summarize here the main features from my previous work:

- (6) *Subjective* veridicality and agent commitment (summarizing from my earlier work):
- a. Truth assessment is relativized to epistemic agents.
 - b. In unembedded sentences the epistemic agent is the speaker.
 - c. In embedded sentences, possible epistemic agents are the speaker and the embedding clause subject. In embedded sentences generally the number of epistemic agents is +1 from the base case.
 - d. In texts, an additional epistemic agent is the hearer/reader.
 - e. Nothing else is a relevant epistemic agent.
 - f. Nonveridicality judgments are gradable, because epistemic agents can be fully committed to a proposition (veridicality), partially committed to it (nonveridicality, universal modals), or trivially committed (nonveridicality, mere possibility).

For those working on veridicality, it is understood that judgments of veridicality may not always be categorical (see especially [3]), because assessing veridicality relies on the beliefs and knowledge of the epistemic agent, i.e. the person assessing a proposition. As indicated above, there are at least three possibilities: full commitment, partial commitment, and trivial commitment.³

The crucial ingredient of (non)veridicality understood this way is that it makes reference to some agent’s epistemic state, by default the speaker’s. Every sentence is evaluated with respect

²[20] characterizes direct perception verbs such as *see* as veridical because if *I see a unicorn* is true, then a unicorn exists, but Zwarts and Giannakidou offer definitions based on truth (see [12] for a formal connection between truth commitment and existence, especially with non-propositional functions such as the progressive and TRY). Other authors have also used other labels, e.g. factivity, factuality, or ‘veridicity’ [15]; [16], [17]) to refer to what I call here objective veridicality.

³Subjective (non)veridicality is shown, in recent work, to be important in extracting truth assessment from texts; [3] say that ‘unadorned’ declaratives like *Ariadne left* convey firm speaker commitment, whereas qualified variants with modal verbs or embedded sentences ‘imbue the sentence with uncertainty’ (deMarneffe 2012: 102). [22], in a recent study, examine the interactions between nonveridicality and evaluative structure in corpora, and draw a number of useful conclusions such as: (a) a nonveridical device ‘tampers with the evaluative content of utterances, with the result of weakening the evaluation (TT: 2012: 316); and (b) nonveridical elements in the majority of cases modify polarity at the local level, i.e. the level of the clause (TT: 2012: 317).

to an agent’s epistemic state. The agent’s epistemic state is what update semantics calls an *information state*: a set of worlds, representing what the epistemic agent i knows or believes. I called those epistemic states *models of individuals*. In main assertions, the model represents the epistemic state of the speaker. A proposition p of a main assertion will be evaluated with respect to this model:

- (7) *Epistemic model of an individual i* (Giannakidou 1999: (45))
 An epistemic model $M(i) \in M$ is a set of worlds associated with an individual i representing worlds compatible with what i believes or knows.
- (8) *Truth in an epistemic model* (=full commitment)
 A proposition p is true in an epistemic model $M(i)$ iff $M(i) \subseteq p$: $\forall w[w \in M(i) \rightarrow w \in \{w' | p(w')\}]$
- (9) a. John won the race.
 b. $\llbracket \text{John won the race} \rrbracket^M = 1$ iff
 $\forall w[w \in M(\text{speaker}) \rightarrow w \in \{w' | \text{John won the race in } w'\}]$

If the speaker decides in a context to assert the sentence *John won the race*, she must believe or know that John won the race, hence all worlds in $M(\text{speaker})$ are John-won-the race worlds: $M(\text{speaker}) \subseteq p$. In an unembedded assertion, the speaker knows or believes that the actual world is within these worlds. Unembedded unmodalized assertions are veridical.

- (10) Definition 1: *Veridicality and nonveridicality* (Giannakidou 1998, 1999, 2011)
 a. A propositional operator F is veridical iff Fp entails or presupposes that p is true in some individual’s model $M(i)$. p is true in $M(i)$ iff $M(i) \subseteq p$, i.e. if all worlds in $M(i)$ are p -worlds.
 b. Otherwise, F is nonveridical.

I will be talking now about $M(i)$ from now on as an information state, following the terminology of update semantics. The definition allows us to define the information states themselves as veridical or nonveridical, as follows:

- (11) Definition 2: *Veridical and nonveridical information states* (version 1, classical)
 a. An information state (a set of worlds) $W(i)$ relative to an epistemic agent i is *veridical* with respect to a proposition p iff all worlds in $W(i)$ are p -worlds. (*Homogenous information state*).
 b. If there is at least one world in $W(i)$ that is a $\neg p$ world, then $W(i)$ is nonveridical.

I call this the classical version because it is the one I have argued for in my polarity work. A nonveridical state $W(i)$ is defined as one that contains at least one $\neg p$ world, and the definition (by ‘at least’), allows all the worlds to be $\neg p$. When this is the case, the state is *antiveridical*. This is the case of negative assertions. Negative and nonveridical assertions license NPIs, so the definition above captures this fact nicely.

However, when we think of informative content and agent commitment, veridical and antiveridical assertions are similar in this: they are both homogenous and commit the agent to their proposition. A veridical information state is positively homogenous— all worlds are p worlds— and therefore positively commits the speaker to p . The actual world is in the p space. Pragmatically, a homogenous state corresponds to adding the proposition to the common ground. I call this full informativity, and it is what we typically observe with positive, unmodalized assertions. Crucially, negative unmodalized assertions (e.g. *Ariadne didn’t win the*

race) also convey homogenous information states: in the negative sentence, all worlds are $\neg p$ worlds, the speaker is negatively committed, and $\neg p$ is added to the common ground. So, a negative assertion is still fully informative, the actual world is in the $\neg p$ space. We can thus now say that veridical and anti veridical spaces are both non-inquisitive by being homogenous.

- (12) Fact: *Homogeneity and non-inquisitiveness*
Homogenous information states (veridical, antiveridical) are non-inquisitive.

Homogenous states contrast with states that convey uncertainty. Uncertainty states are nonveridical states (containing at least one $\neg p$ world), which are non-homogenous: we exclude the case where all worlds are $\neg p$ worlds. The set $W(i)$ is partitioned into p and $\neg p$ worlds, and i is undecided as to whether the actual world is in the p or $\neg p$ space. Separation of the antiveridical from the nonveridical state is indeed also empirically necessary when we consider other grammatical phenomena such as mood choice (that separate negation from uncertainty), though as I said, in terms of NPI-licensing they behave as a natural class. Incorporating (non)homogeneity requires modification of Definition 2 as follows:

- (13) Definition 3: *(Non)veridicality and (Non)homogeneity*
- a. An information state (a set of worlds) $W(i)$ relative to an epistemic agent i is *veridical* with respect to a proposition p iff all worlds in $W(i)$ are p -worlds. (*Positively homogenous state*).
 - b. An information state $W(i)$ relative to an epistemic agent i is *antiveridical* with respect to a proposition p iff all worlds in $W(i)$ are $\neg p$ worlds. (*Negatively homogenous state*).
 - c. An information state $W(i)$ relative to an epistemic agent i is *nonveridical* with respect to a proposition p iff $W(i)$ is partitioned into p and $\neg p$ worlds. (*Non-homogenous state*)

This definition separates antiveridicality and veridicality— both homogenous, fully informative states— from nonveridical ones, which are now defined as being partitioned into a positive and a negative space. Nonveridicality thus creates a polar (p and $\neg p$) partitioning in the information space, and the speaker is undecided as to where the actual world is. Unbiased polar questions (*Did Ariadne win the race?*) convey typical nonveridical information states under Definition 3. So, inquisitive and nonveridical seem to describe the same set of states.

Questions, further, are *prototypically* inquisitive in that they convey nonveridical equilibrium between p and $\neg p$, and we really don't know where the actual world is.

- (14) *Nonveridical equilibrium* (= prototypical inquisitiveness)
- a. An information state W is in nonveridical equilibrium iff W is partitioned into p and $\neg p$, and there is no bias towards p or $\neg p$.
 - b. Sentences with nonveridical equilibrium are inquisitive prototypes.

I define bias in the next section (following suggestions in [11]). Sentences with nonveridical equilibrium cannot be informative since the agent's epistemic state is equally divided between p and $\neg p$ worlds, hence the triviality of informative content. Non-biased polar questions convey this nonveridical equilibrium. But various devices (e.g. a tag, intonation, an NPI, or universal modals, as I claim next) can be employed to tamper with the equilibrium:

- (15) a. Ariadne won the race, didn't she?
b. Aren't you a communist?

c. Are you even listening?

In these cases, there is bias towards a positive (a,b) or a negative (c) answer. The sentences are still nonveridical and compatible with both p and $\neg p$, but the inquisitive equilibrium is lost. In inquisitive semantics, we should be able to capture this effect in a principled way, and I suggest below, following Giannakidou and Mari, bias *measures*.

How about disjunctions? At first glance, it would be appealing to think of disjunctive assertions as also conveying equilibrium:

(16) Ariadne ate cereal or a muffin.

[25] offers a proof for the nonveridicality of disjunction: simply put, p or q does not entail p and does not entail q . By Definition 1, this renders disjunction nonveridical, and in Greek, disjunction also licenses NPis. However, does disjunction induce polar partition between p and $\neg p$? Not so. Disjunction, rather, partitions the epistemic space into p and q , and is inquisitive in the sense that we do not know where the actual world is.

(17) \llbracket Ariadne ate cereal or a muffin $\rrbracket = \{\{\text{Ariadne ate cereal}\}, \{\text{Ariadne ate a muffin}\}\}$

On the exclusive reading of the disjunction, the worlds in which Ariadne eats cereal are worlds in which she doesn't eat a muffin, and likewise, the worlds in which she eats a muffin are worlds where she does not eat cereal. There is equilibrium between two choices (eating a muffin and eating cereal); but this is not strictly speaking the nonveridical partition between p and $\neg p$: the information state contains only positive states p and q . And there is a bias towards positive resolution, as the disjunction logically necessitates that at least one disjunct be true.

For present purposes, it is important to stress that disjunction, though a non-homogenous space, it is not nonveridical in the sense of Def. 3; rather, it expresses a choice space of two positive options. For reasons of space, I am afraid that I cannot address the full range of implications that come from this difference. Suffice it to say two things. First, questions and disjunctions are also distinguished in InqB: the former are inquisitive whereas the latter are *hybrids*. The notion of the hybrid is very useful for capturing the general class of mixed cases of inquisitive assertions that I am talking about in this paper—and this maybe a good reason to think of InqB as a more preferable system than InqD. Second, the NPI licensing potential between questions (polar partitioning, nonveridical equilibrium) and disjunctions is quite different. Though disjunction licenses NPis in Greek, it doesn't in English (compare the acceptable Greek (18-c) to its English equivalent in (18-b)), and is generally not a very common licenser cross linguistically:

- (18) a. Did Ariadne talk to anyone?
b. ??Either Ariadne talked to anyone, or Bill revealed our secret.
c. I i Ariadne milise me kanenan, i o Bill prodose to mistiko mas.
either the Ariadne spoke with n-person or the Bill revealed the secret our
'Either Ariadne spoke to someone, or Bill revealed our secret.'

So, though non-homogenous, disjunction is a weaker NPI licenser than questions because it does not explicitly present a choice between p and $\neg p$, the choice required for NPI-licensing. Disjunction may, of course, also be polar as in e.g. *to be or not to be*, in which case it presents a regular case of nonveridical partitioning.

With these in mind, let us now consider assertions with existential and universal modals. We see that with existential modals the equilibrium is preserved, but with universal modals it is lost because assertions containing them convey informational bias towards p .

3 Modality and bias

I have argued earlier that all modal verbs are nonveridical ([4],[6],[7],[8]); and in recent work with Alda Mari, we have described the effect of modal verbs and particles, including the future morpheme as *epistemic weakening*. The idea that modal assertions are weaker than unmodalized assertions can be traced back to Karttunen’s work, where he argues that *must* is weak in that it does not entail the truth of its proposition, that is, *must p* does not add *p* to the common ground. Karttunen linked the weakness of *must* to a kind of evidentiality (needing indirect evidence; though in Giannakidou and Mari we argue that *must* is weak because it relies on *partial* knowledge, not necessarily indirect).

With an existential modal it is obvious why we have weakness:

- (19) Ariadne might be a doctor.

In asserting the sentence above, the speaker conveys that she considers it possible that Ariadne is a doctor, and nothing more than that. There is no commitment on her part that Ariadne is a doctor; the speaker merely states that she does not consider it impossible that she is. In dynamic semantics, *might* is a test for consistency. As [23] puts it: “one has to agree to $\diamond\phi$ if ϕ is consistent with one’s knowledge—or rather with what one takes to be one’s knowledge. Otherwise $\diamond\phi$ is to be rejected.” So a sentence $\diamond\phi$ checks whether ϕ is compatible with the information state *s* of the speaker. If it is compatible, i.e. if $s[\phi]$ is not empty, the information state is left unchanged. If it is not compatible, the result is a defective information state, the empty set. In such an analysis, the existential modal is not just weak, it simply lacks truth conditional content; it only has dynamic content. In this analysis, then, $\diamond\phi$ does not convey any information. So, here we have an assertive sentence that lacks informativity.

Now consider the universal modals with MUST. Here are examples from Greek and English:

- (20) I Ariadne prepi na ine giatros.
‘Ariadne must be a doctor’

In dynamic semantics, the necessity modal is also a test: does the current information state already contain the information conveyed by *p*? If it does, MUST *p* leaves the state unchanged; if it does not, it gives the defective state, the empty set. Again, the contribution of the modal is only dynamic (hence rather weak truth conditionally), but this does not allow us to capture the fact that with the universal modal the speaker seems to be saying something considerably stronger, or more informative than mere possibility. In the dynamic analysis, the content of the natural language words *must*, *prepi* etc. is not addressed at all.

Here I will assume a Kratzerian framework of modals (with the refinements in [21]). Universal epistemic modals seem to comprise a somewhat dual nature. They convey more commitment than mere possibility modals: in the sentence above we get the message that the likelihood of Ariadne being a doctor is really high, that the speaker has some certainty that Ariadne is a doctor. The speaker seems to have combined knowledge that supports *p* in a way stronger than mere possibility. We can say, therefore, that MUST *p* contains a bias towards *p*. However, this bias is not the full commitment of veridical, homogenous assertions; MUST still allows for the possibility of $\neg p$. Consider the following examples, from [10] (the (a) examples from Greek, the (b) examples from Italian):

- (21) a. I Ariadne ine arosti, #ala dhen ime ke endelos sigouri.
the Ariadne is sick but not I.am and entirely sure

- b. Giacomo è malato, #ma non sono sicura.
 Giacomo is sick but not I.am sure
 ‘Ariadne/Giacomo is sick, #but I am not entirely sure.’
- (22) a. I Ariadne prepri na ine arosti, ala dhen ime ke endelos sigouri.
 the Ariadne must SUBJ be.3sg sick but not I.am and entirely sure
- b. Giacomo dove essere malato, ma non sono sicura.
 Giacomo must be sick but not I.am sure
 ‘Ariadne/Giacomo must be sick, but I am not entirely sure.’

Here we see the clear contrast in terms of veridicality between unmodalized assertions and assertions with MUST. In a recent presentation, [19] further offers a wealth of data from English *must* illustrating, in response to [24]) that *must* indicates reduced speaker commitment:

- (23) Probably this must have been done before, *but I couldn't find enough information* on this in the ISS docs.
- (24) If the handgun was engraved or had some sort of fancier finish then *I figured he must be a pistolero. I might have been wrong but those were my initial impressions.*

The strength of speaker's commitment here is governed by *I figured*, *I couldn't find enough information*. So MUST shows reduced commitment to p , compared to the veridical past or present assertion.

Following [11]; [10], I will claim here that universal modals convey partial commitment, i.e. universal quantification within a modal subspace while also allowing non- p worlds in the rest of the modal base.

- (25) For any world w , conversational backgrounds f, g and epistemic agent i :
 $[MUST]^{w, f, g, i} = \lambda q_{<st>}. \forall w' \in Best_{g(w)}(\cap f(w)) : q(w') = 1$
 where $Best_{g(w)(X)}$ selects the most ideal worlds from X , given the ordering $g(w)$ determined by i

Must universally quantifies over a restricted set of the modal base $\cap f(w)$, the best worlds. In the best worlds, p is true. But $\cap f(w)$ also contains non- p worlds, it is not a homogenous domain. This renders *must* nonveridical, and weaker than the plain assertion, where the information state of the speaker is not partitioned. We can think of the best worlds as the inner domain of MUST (following the terminology in [18]); the whole $\cap f(w)$ is the outer domain. By being a universal, MUST is homogenous within the inner domain, but nonveridical with respect to the outer domain.

The modal base $\cap f(w)$ argument of MUST, then, is partitioned into p and $\neg p$ worlds, just like with questions. And, importantly, on a par with these, the speaker is uncertain as to where to place the actual world. Giannakidou and Mari propose a presupposition for universal modals that there is a measure of the bias. The measure of the bias is the measure of likelihood, according to the agent, that the actual world will be among the best worlds:

- (26) *Positive bias* with universal epistemic modals (Giannakidou and Mari 2013)
- a. There is a bias measure $\mu_{likelihood}$ determined by the epistemic agent i that measures the likelihood, according to i , that the actual world is within the set of the best worlds.
- b. The value of $\mu_{likelihood}$ is by default high (i.e. akin to *probably*).

So, unlike with questions where we have nonveridical equilibrium, p and $\neg p$ with universal

modals, are not informationally equivalent options. Rather, the p space is ranked as best. The ordering source $g(w)$, orders the worlds in $\cap f(w)$ according to normalcy assumptions, following Kratzer and Portner. Modal expressions of necessity quantify over those worlds *that adhere to the norms in the ordering source as much as possible*. So, given normal assumptions, there is an informational imbalance within the $\cap f(w)$ that creates positive bias towards p ; and this drives the choice to use a universal modal in the first place.

Giannakidou and Mari suggest that the bias within the modal base can by default be spelled out as an adverb of high confidence (such as *probably*), which often accompanies overtly universal modals (e.g. *You must probably think I'm crazy*). As indicated above, the adverbs provide the measure of likelihood, according to the agent i , that the actual world will be among the best worlds. If *probably* is the default, then the bias is relatively high (Giannakidou and Mari, above 80 on a scale of 100). This high bias towards p correlates with higher informational strength of the sentence. MUST sentences are clearly more informative than possibility sentences or questions— though still not as informative as veridical assertions which are not partitioned and place the actual world within the p space.

Let us me close now by summarizing what I think we have learned from this paper, and suggest how these lessons can help us refine some of the core premises in inquisitive semantics.

4 Inquisitiveness, (non)veridicality, and (non)homogeneity

Recall now the basic tenets of inquisitive semantics as discussed in Ciardelli et al. in press:

- (27) Fact 2 (Inquisitiveness in terms of possibilities)
- a. ϕ is inquisitive iff there are at least two possibilities for ϕ .
 - b. ϕ is an assertion iff there is exactly one possibility for ϕ .

By Fact 2, and given that the two possibilities for ϕ are ϕ and $\neg\phi$, inquisitiveness becomes synonymous to nonveridicality, as we defined it in Definition 3, repeated here:

- (28) Definition 3: *(Non)veridicality and (Non)homogeneity*
- a. An information state (a set of worlds) $W(i)$ relative to an epistemic agent i is *veridical* with respect to a proposition p iff all worlds in $W(i)$ are p -worlds. (*Positively homogenous state*).
 - b. An information state $W(i)$ relative to an epistemic agent i is *antiveridical* with respect to a proposition p iff all worlds in $W(i)$ are $\neg p$ worlds. (*Negatively homogenous state*).
 - c. An information state $W(i)$ relative to an epistemic agent i is *nonveridical* with respect to a proposition p iff $W(i)$ is partitioned into p and $\neg p$ worlds. (*Non-homogenous state*)

Inquisitive and nonveridical sentences convey nonveridical epistemic states, i.e. states with polar partitioning into p and $\neg p$ worlds. So, inquisitive and nonveridical sentences boil down to the same thing. This is, I think, an important link to establish.

In questions, there is nonveridical equilibrium, true uncertainty as to where the actual world is, i.e. in the positive or the negative space. The equilibrium is disrupted, as I noted, when the question is manipulated by material that creates bias. Universal modals are also manipulators of the nonveridical equilibrium, and create bias towards ϕ . What is common in all nonveridical/inquisitive states is that the epistemic agent has a choice about where to place the actual world: in the positive or in the negative space.

Disjunctions, as we also noted, come with partitioned spaces too. The partition can be the expected polar one (*it rained or it didn't rain*), but it doesn't have to be; it can also be a choice between two positive choices, p and q .

The final lesson from this paper has to do with the division of labor between informativity and inquisitiveness. Roughly, the proposed distinction in Ciardelli et al. is the following:

- (29) Inquisitiveness and Informativity
- a. A question $?\phi$ has trivial informative content.
 - b. An assertion $Assert\phi$ has trivial inquisitive content.

Our discussion has shown that nonveridical assertions are inquisitive, they thus have non-trivial inquisitive content; and they are informationally weaker than past or present positive and negative assertions. So, from the point of view of nonveridicality, assertions do not behave as a uniform class, therefore a categorical distinction between assertion (trivial inquisitive content) and question (trivial informative content) is not desirable. Biased questions, at the same time, convey substantial information; hence, though inquisitive, their informative content is non-trivial. This suggests that the divide between inquisitiveness and informativity does not map straightforwardly onto assertion vs. question, and we have support for the original conception of meaning in inquisitive semantics as being semantically non-dichotomous.

In the end, what seems to matter is whether a sentence presents the epistemic agent with one or more possibilities about the world, i.e. whether it reflects a homogenous or non-homogenous epistemic space. Superficially, this appears to correspond to the contrast between assertion vs. question. However, nonveridical assertions (which are 'inquisitive') show us that the contrast is just that: superficial. The more fundamental distinction is between a partitioned or not epistemic space: this matters for a number of phenomena such as NPIs, FCIs, mood choice (subjunctive-indicative), deontic modals, and possibly also other non-assertions such as imperatives— as I have been suggesting in my work for some years now. Thus, it seems unavoidable to conclude that nonveridical partitioning (inquisitiveness) vs. homogeneity is telling us something very essential about the logic of human language.

References

- [1] Ivano Ciardelli, Jeroen Groenendijk, and Floris Roelofsen. Inquisitive semantics: a new notion of meaning. *Language and Linguistics Compass*, 7:459–476, 2013.
- [2] Ivano Ciardelli, Jeroen Groenendijk, and Floris Roelofsen. On the semantics and logic of declaratives and interrogatives. *Synthese*, in press.
- [3] M. De Marneffe, Chris Manning, and Christopher Potts. Did it happen? the pragmatic complexity of the veridicality judgement. *Computational Linguistics*, 38:300–333, 2012.
- [4] Anastasia Giannakidou. The semantic licensing of NPIs and the Modern Greek subjunctive. In Ale de Boer, Helen de Hoop, and Henriëtte de Swart, editors, *Language and Cognition 4, Yearbook of the Research Group for Theoretical and Experimental Linguistics*, pages 55–68. University of Groningen, 1994.
- [5] Anastasia Giannakidou. Subjunctive, habituality and negative polarity. In Theresa Galloway Mandy Simons, editor, *Semantics and Linguistic Theory (SALT) V*, pages 94–112. CLC Publications, Cornell University, 1995.
- [6] Anastasia Giannakidou. *The landscape of polarity items*. PhD thesis, University of Groningen, 1997.
- [7] Anastasia Giannakidou. *Polarity Sensitivity as (non)veridical Dependency*. John Benjamins Publishing Company, Amsterdam, 1998.

- [8] Anastasia Giannakidou. Affective dependencies. *Linguistics and Philosophy*, 22(4):367–421, 1999.
- [9] Anastasia Giannakidou. Positive polarity items and negative polarity items: variation, licensing, and compositionality. In Claudia Maienborn, Klaus von Heusinger, and Paul Portner, editors, *Semantics: An International Handbook of Natural Language Meaning (Second edition)*, chapter 62, pages 1660–1712. Mouton de Gruyter, 2011.
- [10] Anastasia Giannakidou and Alda Mari. Evidential reasoning with future and must: epistemic weakening and partial knowledge. *For Lingua*, 2013.
- [11] Anastasia Giannakidou and Alda Mari. A two dimensional analysis of the future: modal adverbs and speaker’s bias. In *Proceeding of the 19th Amsterdam Colloquium*, 2013.
- [12] Anastasia Giannakidou and Josep Quer. Exhaustive and non-exhaustive variation with free choice and referential vagueness: Evidence from Greek, Catalan, and Spanish. *Lingua*, 126:120–149, March 2013.
- [13] J. Groenendijk and M. Stokhof. *Studies on the Semantics of Questions and the Pragmatics of Answers*. PhD thesis, University of Amsterdam, Amsterdam, 1984.
- [14] Jeroen Groenendijk. Inquisitive semantics: two possibilities for disjunction. In J.M Larrazabal and L. Zubeldia, editors, *Meaning, content and argument: Proceedings of the ILCLI International Workshop on Semantics, Pragmatics and Rhetoric*, pages 41–72. Universidad del País Vasco: San Sebastián, 2009.
- [15] Lauri Karttunen. Possible and must. In *Syntax and semantics volume 1*. Academic Press, New York, 1972.
- [16] Lauri Karttunen and Annie Zaenen. Veridicity. In Graham Katz, James Pustejovsky, and Frank Schilder, editors, *Annotating, Extracting and Reasoning about Time and Events*. Dagstuhl Seminar Proceedings, Dagstuhl, 2005.
- [17] P. Kiparsky and 1970 C. Kiparsky. Fact. In M. Bierwisch and K. Heilolph, editors, *Progress in Linguistics*. Mouton, 1970.
- [18] Joshua Knobe and Zoltan Szabo. Modals with a test of the deontic. *Semantics and Pragmatics*, 6, 2013.
- [19] Dan Lassiter. The weakness of *must*: In defense of a mantra. Presented at CSLI Workshop Perspectives on Modality, 2013.
- [20] Richard Montague. On the nature of certain philosophical entities. *The Monist*, 53:159–194, 1969.
- [21] Paul Portner. *Modality*. Oxford University Press, Oxford, 2009.
- [22] Radoslava Trnavač and Maite Taboada. The contribution of nonveridical rhetorical relations to evaluation in discourse. *Linguistic Sciences*, 34:301–318, 2012.
- [23] Frank Veltman. Defaults in update semantics. *Journal of Philosophical Logic*, 25:221–261, 1996.
- [24] Kai von Fintel and Anthony S Gillies. Must...stay... strong! *Natural Language Semantics*, 18:351–383, 2010.
- [25] Frans Zwarts. Nonveridical contexts. *Linguistic Analysis*, 1995.