



**FUNDAMENTALS OF CONTEMPORARY FORMAL SEMANTICS:  
AN INTERVIEW WITH GENNARO CHIECHIA  
FUNDAMENTOS DA SEMÂNTICA CONTEMPORÂNEA:  
UMA ENTREVISTA COM GENNARO CHIERCHIA**

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**ABSTRACT**

The interview surveys the main topics that constitute common-ground in contemporary semantics aiming at introducing a map to guide students' education as linguists.

**KEYWORDS:** Education, Natural Language Semantics, Formal

**RESUMO**

A entrevista revisa os principais tópicos que constituem conhecimento compartilhado na semântica contemporânea, com o objetivo de apresentar um mapa de estudos para a formação do linguista.

**PALAVRAS-CHAVE:** Educação, Semântica das Línguas Naturais, Formal

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## Presentation

Gennaro Chierchia has been described as one of “the most beloved linguists of our times, who has proposed some of the most exciting ideas in semantics.”<sup>4</sup> A Linguistics and Philosophy Professor at Harvard University (Cambridge, MA, USA), Chierchia authored, with Sally McConnell-Ginet, the famous textbook *Meaning and Grammar: An Introduction to Semantics* (MIT Press, 1990). In Brazil, the translation of his more recent, but equally well-known textbook, named *Semantica, Le Strutture del Linguaggio* (1997), and translated to Portuguese by Rodolfo Ilari, Luiz Arthur Pagani and Lígia Negri, in 2003 played a crucial role in the field. Besides, he authored the book *Logic in Grammar* (Oxford University Press, 2013). The extension of his work is impressive; we will mention only a few examples: the articles “Reference to Kinds across Languages” (Natural Language Semantics, 1998), “Plurality of mass nouns and the notion of “semantic parameter” (Springer, 1998) and “Scalar implicatures and their interface with grammar (Annual Review of Linguistics, 2017). Within the many and diverse semantic issues his work has become a seminal reference for the question of how the mass/count opposition affects grammar stands out. This interview, performed by Roberta Pires de Oliveira, who has been his research partner and fellow professor at Harvard, surveys the main topics that constitute common ground in contemporary semantics, while aiming at introducing a map to guide students’ education as semanticists. The interview was divided in blocks, each one exploring a distinct subtopic. The final edition of the material was up to an admirer of both researchers, Ana Paula Quadros Gomes<sup>5</sup>.

### (i) Boolean Core

**Roberta:** Let’s think about young linguists who want to work within the tradition of formal semantics: what is the basic level of knowledge they have to attain in order to understand contemporary research? Let’s design an ideal one-year program.

**Gennaro:** To begin with, we should avoid talking about foundational issues, because if we do, we are going to get stuck immediately. One of the characteristics of modern semantics is that we have made progress on many substantive issues and we can rely on widely shared formalisms that are somehow neutral on foundational questions. For instance, let’s avoid discussing what truth conditions “really” are.

**Roberta:** Ok. Common ground in semantics has increased substantially since the beginning of the 70’s, when Montague’s program got to be integrated within generative linguistics (PARTEE, 2014).

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4 <https://www.gf.org/fellows/all-fellows/gennaro-chierchia/>

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**Gennaro:** Yes, at that time, there was very little common ground. So, let's review the areas where, I believe there is widespread agreement nowadays. The first is what one might call the Boolean Core: the fact that negation, conjunction, and disjunction have a Boolean, cross categorial character, in the sense that you can coordinate through disjunction and conjunction across a wide range of syntactic categories, not necessarily with the same word<sup>6</sup>, but with words that have a similar logical behavior.

**Roberta:** In all languages, connectives may combine across categories, as in:

1. a. John is reading and Mary is smoking
- b. John and Mary are reading. (nouns)
- c. John is reading and writing. (verbs)
- d. John is tall and fat. (adjectives)

In a naïve perspective, the meaning of the sentences in (1) is so trivial. Nobody pays attention to them. And yet the paradigm in (1) displays something important: the cross-categorial nature of conjunction. In (1a) we conjoin sentences, in (1b) proper names, in (1c) verbs, and in (1d) adjectives. One could imagine deriving the sentences (1b) - (1d) via ellipsis. But relying solely on ellipsis is problematic in view of sentences like (2). Sentence (2a) does not convey the same information as (2b):

2. a. Somebody talks and reads
- b. Somebody talks and somebody reads.

This motivated the introduction of cross categorial Boolean operators (which can be defined using the lambda-operator). In 2020, the Boolean core is standard background knowledge and we want our students to grasp these tools very quickly. What an amazing explosion of knowledge we had had in these last few years, hasn't we? Not only in technical terms, but also the need to deeply understand language variation (MATTHEWSON, 2001), language acquisition (CRAIN, 1991), and the development of experimental methods in semantics. We know that not all languages have a conjunctive connective like 'and', not all languages have determiners or nominal quantifiers (MÜLLER & BERTUCCI, 2012, among others about Karitiana). Obviously, we all agree that we cannot do without very basic concepts like that of 'function'. The meaning of 'smokes' consists in the ability to split the world into those who smoke and those who don't. This is the way language works on us. The Boolean Core is one of the basic features of semantics, across languages. And this is important!

**Gennaro:** Exactly.

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<sup>6</sup> E.g. in Latin the enclitic *-que* is mostly used for NP-level conjunction, while *et* and *ac* are used for sentence level coordination. But the interpretation of the two coordinating particles displays a related logic.

(ii) **Quantifiers and Binding**

**Gennaro:** A domain where much is shared is quantifiers and binding. That typically involves the interpretation of pronouns, and scope assignment. By scope assignment I mean what goes on in interpreting sentences like:

3. At least a technician and a pilot inspected every plane.

**Roberta:** Well, this sentence has more than one interpretation. We might imagine that every plane scopes over at least a technician and a pilot, meaning that every plane is such that it was inspected by at least a technician and a pilot, as represented in (4):

4. [Every plane] [at least a technician and a pilot inspected t1]

It leaves a trace that must be bound...

**Gennaro:** There are two main views on scope: on one view, scope is positional: scope is derived by moving (covertly) the quantified noun phrase to a designated position, where it is intended to be interpreted. Like in Classical Logic, the position of the quantifier determines its scope. This view is represented in (4). The other view, instead, relies on type lifting mechanisms.<sup>7</sup>

**Roberta:** Very briefly, type lifting (or type shifting) is a mechanism used to explain how certain expressions seem to have multiple meanings in a regular, predictable way. Partee (1986) shows this for the nominal domain. A referential Noun Phrase like *John* has a meaning at the level of individuals (type *e*). But it can be conjoined with quantifiers as in *John and some friends*; here it's as if *John* got lifted to a quantifier phrase, of type  $\langle\langle e, t \rangle, t \rangle$ . If type shifting is needed anyway, then we may try to use it to explain scope assignment without using movement. At the same time, we also know that movement is needed anyway. So both movement and type lifting are independently needed in grammar.

**Gennaro:** Right. And both movement and type-lifting as theories of scope wind up confronting similar problems: for the movement approach, where is it that you can put a quantifier? For the type lifting approach, where is it that you can apply a certain type lifting that would enable the quantifier to assume that particular scope? It is interesting to have different formal devices that can do similar things. In this instance, on the one hand we have the classical devices of quantifier binding or lambda abstraction, on the other, we can do similar things with type lifting. And so we wonder whether the way we compute scope and binding in our heads, our own mental 'software', is more like the first device or more like the second. The two systems are extensionally equivalent in that they compute the same scope configurations for the same string of words as in (3). Everything that you can express in one theory you can express in the other. There are standard translations between the two. But does the one we are

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<sup>7</sup> Heim & Kratzer (1998) solves the ambiguity via movement; Jacobson (1999), using type shifting and variable free semantics.

actually using resemble more the first or the second? This looks like a well-designed empirical question, although it might be very hard, in fact, to decide. And this is my understanding of one of the fundamental features of the *Generative Enterprise*: what matters is not so much the weak generative capacity, but the strong one, which has to do with the structures through which speakers actually perform their computations.

**Roberta:** Could you say more about those capacities?

**Gennaro:** Very roughly, if you are talking about a formal language, the weak generative capacity is simply the strings that you are able to generate, and the strong generative capacity are the trees that represent the computations through which you generate them, and the abstract categories that you use in building those trees. And the same applies to semantics. Combinatory logic and classical logic are inter-translatable, they have the same weak generative capacity, but the ways in which entailments are proven are very different, depending on the logic. The steps through which you have to go to prove things vary.

**Roberta:** And our minds may be one way or another. Which model is closer to the way our mind/brains work? But in so far as natural languages are concerned, there is a consensus that all languages have generalized quantifiers.

**Gennaro:** At some level, yes. Although it is claimed that there are languages that don't have determiner-quantifiers.

**Roberta:** Yes, Karitiana, (Tupian family, Arikém branch or subfamily, a language spoken in Brazil), might not have nominal determiner-quantifiers.

**Gennaro:** Exactly, so Karitiana wouldn't have nominal generalized quantifiers. It might still have, though, some form of generalized quantifier, in the sense of a relation between sets. If we agree to call generalized determiner a relation between sets, and leave it open whether they are sets of individuals or sets of events, which is at the basis of the difference between *every* and *always*, then it might be possible to claim that all languages have generalized quantifiers.<sup>8</sup>

**Roberta:** What about Binding?

**Gennaro:** Binding theoretic questions constitute another fundamental area of inquiry, right at the interface between syntax and semantics. By that, I mean things like the interpretation of reflexives versus non reflexives pronouns, and what has come to be known as weak and strong crossover. Strong crossover is subsumed under Principle C of the Binding Theory of Chomsky's Pisa Lectures, under the assumption that traces are assimilated to referential expressions. Consider:

5. \*Who<sub>1</sub> does he<sub>1</sub> think [t<sub>1</sub> deserves the prize]?

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<sup>8</sup> The classical paper on generalized quantifiers is Barwise & Cooper (1981).

The question in (5) is never interpreted as a question about who is such that he thinks that he deserves the prize. In principle, it ought to be possible for the sentence in (6) to have the interpretation represented by the indexing you see there. But that doesn't happen. Why? If we regard the trace  $t$  in (5) on a par with a proper noun, then we rule out the coindexing in (6) as a Principle C violation and we can exclude the unwanted interpretation.

Weak cross over deals with forms of deviance that are not as severe as (5). Here is a well-known example:

6. \* Who<sub>1</sub> does his mother<sub>1</sub> love  $t_1$ ?

The sentence in (6) cannot be interpreted as: who is such that his mother loves him. Again, a priori such an interpretation ought to be possible; but we just can't formulate the intended question using the structure in (6).

We have to bear in mind that there are two main ways of implementing the idea of binding: one that uses variable, and the one that doesn't.<sup>9</sup> They both would have to confront the same set of phenomena. With variables, one sees almost immediately how the description of the phenomena goes. In a variable free semantics, the basic idea for binding is that pronouns have no meaning; they are the identity function and then there is an operation of function composition that passes this information up until you find the binder. And that's where all the work has to be: when can you pass it up, when you can't. If both theories give the same results, then we can maybe see this issue as one of mapping again: is the syntax of natural languages going to be more naturally mapped in a semantics with or without variables?

A further important related area of inquiry is non c-command anaphora.

**Roberta:** The classic example of non c-command anaphora is the donkey sentence in (7) where it is co-referent with a donkey, even though a donkey does not c-command it, because it is inside a relative clause:

7. Every farmer who has a donkey beats it.

**Gennaro:** The Stoic philosophers are credited to have individuated the problem. In modern times, it was Peter Geach (1962) who resurrected it.

**Roberta:** Heim (1982) and Kamp (1981) gave different answers to the problem of non C-command anaphora, both in a dynamic setting. This is also one of the topics of your 1995 book on the dynamics of meaning. We come back to this when we talk about presuppositions.

**Gennaro:** Yes, the main competitors are representational theories, like Kamp's DRT, Dynamic Semantics, and Situation based semantics. But the phenomena and generalizations

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<sup>9</sup> The main stream in linguistics uses binding with variables, see Heim & Kratzer (1998), for instance. See Jacobson (1999) for binding without variables.

pertaining to non c-command anaphora are largely agreed upon. This is the general point that emerges over an over throughout ongoing research in semantics: a broad set of intriguing generalizations and a number of theoretically interesting competing approaches.

**Roberta:** Quantifiers is the heart of natural languages!

(iii) **Events and Argument Structure**

**Gennaro:** A third important chapter in the first-year curriculum for Semantics is the existence of event arguments. This is a theme that is important to go through with first year students because both the empirical problem and the theoretical explanation are by now fairly easy to state. It is not that you cannot do adverbial modification without events, but it is certainly more complicated because you have to resort to axioms on predicate modification that eventually look arbitrary.

**Roberta:** The comparison is between approaches to adverbs like slowly in (8a).<sup>10</sup> Let's consider the sentences in (8):

8. a. John walked slowly.  
b. John walked.

One might treat slowly as a predicate-level operator, something along the lines of Montague (1974): [slow ( $\lambda w \lambda x$ . walk<sub>w</sub> x)] (j). A problem that appears immediately is then that (8a) does not entail (8b): on this view, walk slowly and walk are two different, possibly unrelated, predicates. A way out is to write axioms that warrant the entailment. But then the entailment from (8a) to (8b) is stipulated, and not a natural consequence of the system, as it should be.

Now imagine that we have such an axiom, something like  $\forall w \forall p \forall x$  [slow<sub>w</sub> (P) (x)  $\rightarrow$  P<sub>w</sub> (x)]. This axiom warrants that (8a) entails (8b). Now, consider that we may add another adverb as in (9):

9. a. John walked slowly in the park.  $\rightarrow$  in the park (slow( $\lambda w \lambda x$ . walk<sub>w</sub> (x)))(j)  
b. John walked in the park.

(9a) plus a generalization of the axiom on predicate modification to in the park will entail (8b), but it will not entail (9b) (i.e. it won't allow 'dropping the 'intermediate' modifier). So we need other axioms. And so on. Since we can keep adding adverbial phrases, we will have to keep adding axioms. There is nothing in principle that blocks this mechanism, but entailments should be a natural consequence of the semantic rules, and on this view of predicate modification, they are not. Moreover, the predicate-operator approach predicts scope interaction if there is more than one adverb as (9a), but this prediction is not borne out.

<sup>10</sup> The argument can be found in Parsons (1990), chapter 4.



**Gennaro:** Yes. That's a good case where positing an abstract event-argument helps: it makes us understand better the way modification works. By that I do not mean to say that events are abstract!

**Roberta** (laughing): I was wondering how come events are abstract... Davidson thought they were particulars, individuals as you and me.

**Gennaro:** They are not abstract! But the event argument is not overtly expressed in the argument structure of verbs, and in this sense the event argument is abstract. But by assuming that there is such an argument, predicate modification starts looking normal. The hypothesis of an event-argument forces one to rethink argument structure in a radical way. This area right now is still wide open. It was Parsons (1990) who really made the argument against Montague's proposal on verb modification. Davidson (1967) was looking for an extensional theory of adverbial modification. His ultimate goal was noble, he was 'naturalizing meaning', trying to avoid positing 'intensional entities'. But he didn't really give a linguistically based argument in favor of his view of verb modification.

**Roberta:** His aim was not adverbial modification in natural languages.

**Gennaro:** Yes, even though adverbs were his evidence in favor of his way of naturalizing meaning. They were being used as a reason to have intensions; Montague wanted to say that *slowly* is a predicate modifier, as you have just described. Davidson didn't want that because that would derail his "naturalization of meaning without intensionality". Moreover, Davidson wanted to do better than Quine who said that adverbs form new predicates. The problem with forming any new predicate is: how do you determine its meaning? If you have a property, you can say that it is a function from a property to a property. But if you don't want to have properties, what do you do? At any rate, it was really Parsons who made the argument against Montague's view, and provided a linguistically based argument to adopt Davidson's view of predicate modification.

**Roberta:** Parsons brought to our attention the Diamond entailment pattern represented by the arrows:

10. a. Brutus stabbed Cesar in the back with a knife
- b. Brutus stabbed Cesar in the back
- c. Brutus stabbed Cesar with a knife
- d. Brutus stabbed Cesar

The pattern of entailments is immediately explained if adverbs are treated as predicate of events.

Parsons shows that the operator view could not derive this pattern in a natural way. A knock-down argument!



**Gennaro:** Yes, this is the argument. So events were introduced as covert arguments of the verb and the notion of function argument structure changed.

**Roberta:** Davidson just introduced the event argument as an extra argument. One place predicate, like *run*, turn into two places predicate:  $\text{Run}(x, e)$ , the runner and the event of running.

**Gennaro:** And then immediately comes the idea of having verbs being just predicates of events and feed the arguments via thematic roles.

**Roberta:** This is the Neo-davidsonian view. It assumes that the predicate *run* only has an event variable:  $\text{Run}(e)$ . There is no argument for the runner. The runner is introduced via thematic roles, which are relations between the event and other individuals. That is, *John runs* analyzed as:

$$11. \quad \exists e [\text{Runing}(e) \wedge \text{Agent}(e, j)]$$

There is a running event and the agent of this event is John. As a consequence, the difference between arguments and adjuncts becomes somewhat blurred, since both are added using conjunction as in (11).

**Gennaro:** One can rebuild the distinction between arguments and adjuncts. That's what Parsons did with his "sub-atomic" semantics. He assumed that the analysis in (11) was a matter of lexical decomposition, so that in a way his theory is the union of the classical theory and Davidson's insights. He simply said that a verb like *hit* would be decomposed in:

$$12. \quad \text{hit} = \lambda x \lambda y \lambda e [\text{hitting}(e) \wedge \text{patient}(e, x) \wedge \text{Agent}(e, y)]$$

A more radical departure from the classical theory of argument structure (i.e. the view that predicates are typed according to the number of arguments they take) is to assume that *hit*, *run* and all verbs are just a unary predicate of event; arguments are added in via thematic role in the syntax, not in the lexicon.

**Roberta:** where everything is done by adjunction. It is worth mentioning that Kratzer (2002) has a kind of intermediate, asymmetric proposal, according to which only the external argument (typically, the agent) is added in the syntax. These are different ways of understanding the lexicon, the syntax, and their relations...

**Gennaro:** Yes. There is still a lot to be explored in this area. It is also important to keep in mind that the notion of function argument structure is inclusive of relation changing mechanisms, things like passive, anti-passive, causative, raising, etc., which are all ways of changing the basic function/argument structures. These are operations that in principle you can handle in the lexicon. In the 80's there were long debates on whether passive and the like happened in the syntax or in the lexicon. It is very natural to think of passive as an operation that

applies to a relation and shifts around the arguments, in a sense (see, e.g. DOWTY, 1978)<sup>11</sup>. The question, though, is exactly how this happens. All these issues fall under the rubric of events and argument structure, one of the fundamentals.

Our fourth fundamental is going to be NP modification and relative clauses.

**(iv) NP modification and Relative Clauses**

**Gennaro:** Relative clauses are one of the keys to the grammar of a language, always. They are beautiful! Here is a weakly theory bound definition of relative clause: it is a sentence that is used as a NP modifier, as in:

13. The city that has public transportation is better off.

The moment you have NP modification, you unleash the power of recursion in a massive way because if NPs corresponds to concepts, and you enable concepts to be modified by clauses, then there is no limit to how many concepts you can form!

**Roberta:** The concept of city, and the concept of city which has public transportation, and the concept of a city that has ecologically free public transportation: The city that has public transportation that is ecologically free is better off. We are free to create concepts, exploiting recursion.

**Gennaro:** This is a very striking feature of languages. And, then, also in this domain of NP modification, we have adjectives, scales and degrees; superlatives and comparatives.

**Roberta:** NP modification is a huge area of study. We all know about the small whale that is big. Adjectives are at the heart of NP modification, and they are predicates on their own. Consider the sentences in (14):

14. a. That is a small whale.  
b. And yet, that is pretty big.

It is not only how to account for our intuitions that (14a) and (14b) can be true at the same time about the same object in the world, but the controversy with respect to degrees, which comparable to the controversies on the inclusion of events in semantics. Should we understand that big is a relation between an individual and a degree on a scale? Or is it the case that the comparison is part of a shared common ground?

**Gennaro:** This is a beautiful controversy! One of the most interesting ongoing one. There are essentially a couple of strategies.

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<sup>11</sup> See Cançado (2005) among others.

**Roberta:** The issue here is the denotation of adjectives. There are two ways: to postulate that some adjectives, degree adjectives, have a degree argument - another “abstract”, covert argument which denotes another kind of entity in our ontology, degrees -, or to treat adjectives as predicates, without a degree argument.<sup>12</sup>

**Gennaro:** Yes, that seems to be pretty much it. On one theory, *John is tall* is represented as tall(j,d), i.e. John is d-tall, where d is some contextually given degree (e.g. 1.75 meters). On the second theory, *John is tall* is represented as tall(C)(j), where C is a contextually given comparison class; tall(C)(j) says that j falls among the tall members of C. These two approaches are naturally connected to two different ways of thinking of comparatives and superlatives.

**Roberta:** There are some languages that might not have adjectives, as Kuikuro (Karib) and Kotiria (Wanano)<sup>13</sup>. And there are languages that compare using a different structure.

**Gennaro:** That’s another very interesting topic, cross linguistic semantics! Degrees certainly map very well onto the syntax of a language like English. The criteria that people use when they study comparatives in under-represented languages is to check whether there are expressions like *er* as in *greater* in English. The reason is that there are two basic strategies across languages to express comparison: the English way *John is taller than Bill* versus a strategy that would say something like *John is tall and Bill is not*, where there is no comparative morpheme but the meaning is the same as John is taller than Bill. In many languages comparatives do not use morphemes like *er*.

**Roberta:** In those languages it is not clear that we need degrees, is that right?

**Gennaro:** Right. *John is taller than Bill* matches very naturally to “the degree to which John is tall is higher than...”, but the other way doesn’t, even though it means the same thing. It is less clear that we need degrees in such languages. Some scholars have pushed the non-degree line very far; Heather Burnett, for instance. It is called ‘delineation semantics’, and it is based, properly speaking on super-valuations.<sup>14</sup>

**Roberta:** the idea of using super-valuation to treat adjectives is quite natural, if we remember that adjectives are related to the Sorites Paradox, which has to do with vagueness: A man with a full head of hair is obviously not bald. Now we take one single hair, and he is still non-bald. Then we take another one, and another one, and another one, eventually we take all his hair, but then we don’t want to say that he is still not-bald, you want to say that he is bald. But when did he stop being haired and turned into a bald man? Super-valuation is one of the tools to deal with this kind of paradox.

12 Kennedy (1997) uses degrees whereas Klein (1980) does not.

13 Quadros Gomes (2015)

14 Burnett (2014). Pires de Oliveira & Mendes de Souza (2018).

**Gennaro:** Yes. If you have these two people and you have to make a decision of who is tall among those two, how do you do it?

**Roberta:** We compare them.

**Gennaro:** Sort of. One might say that *tall* is vague; but given any two people, you know who would you call tall, between those two. Moreover, if I am taller than you, then any way of applying *tall* must be such that if you call yourself tall, you should apply *tall* to me as well. So there are more ‘delineations’ in which I am tall than those in which you are tall. That’s how you reconstruct degrees on a delineation semantics.

**Roberta:** I see. The difference is, in one case, tall is a property from individuals to degrees and, in the other, it is a property of individuals, which is vague. So it can only be defined in the comparison itself and in context.

**Gennaro:** This is an area of great development. Kamp brought it up very early on.

**Roberta:** His famous paper on adjectives is from 1975.

**Gennaro:** Yes, and his student, Ewan Klein (1980) was the first to develop a theory of comparatives based on it. In a way, degrees are the newcomers. Cresswell (1976) introduced them. Adjectives, degrees, comparatives, belong to this big topic: NP modification.

Two other big themes are still missing from our curriculum: one is embedding and complementation; and the other is modalities. Embedding and complementation will lead us to things like propositions and properties.

Embedding and Complementation.

**Roberta:** There are different ways of introducing the idea of embedding. Frege (1980, original 1892) shows that the denotation of an embedded sentence cannot be its “normal” denotation, that is a truth value, because that would mislead us into incorrect belief attributions. Consider (15a) and (15b). Suppose both are true. Even so, one is not allowed to conclude (15c), and the reason is clear: Peter may not know that (15b) is the case, and to report his beliefs as (15c) is to distort what he believes:

15.     a.     Peter believes that Brazil is in South America.
- b.     Brazil has the largest rain forest in the world.
- c.     Peter believes that the largest raining forest in the world is in South America

Frege argues that the denotation of an embedded clause is “indirect”; namely, its ordinary meaning (a “thought”), not its ordinary denotation (a truth value). The idea that embedded clauses denote a proposition is not the only proposal on the market, but it can certainly account,

in a natural way, for the facts above. Very briefly, the idea is that *believe* is a relation between an individual and a proposition. Moreover, propositions can be thought of as sets of worlds. So, (16a) can be taken to say that in all the worlds compatible with Peter's beliefs, it is the case that it is raining. Since propositions, qua sets of worlds, form a Boolean algebra, we can easily explain the continuation in (16b):

16.      a. John believes that it is raining.  
          b. Mary too believes the same and that it is cold

*The same* in (16b) refers to the proposition *it is raining*, which can be conjoined with the proposition *it is cold*, if propositions have a Boolean structure.

**Gennaro:** The view of propositions as sets of worlds leads us to other problems, e.g. the problem of omniscience.

**Roberta:** This is a difficult issue. If propositions are sets of worlds, and one believes *p*, then one also believes all of *p*'s consequences. The same is true about desires, and all other propositional attitudes. So if (17a) is true, then (17b) must be true, since mathematical propositions are true in every world (and hence they all entail each other):

17.      a. John believes that  $2 + 2 = 4$ .  
          b. John believes that 997 is a prime number.

Of course, our minds do not work like that. It may well be that (19a) is true and (19b) false, as John may have no idea of what prime numbers are, for instance.

That means that maybe we need something more fine-grained than propositions. Properties may be? You argue that properties come into play when we have to explain the denotation of infinitive and gerundive clauses as in:

18.      Pavarotti enjoys singing La Traviatta.

Your paper on De Se (CHIERCHIA, 1989) makes clear that propositions cannot be the denotations for this type of complementation; for them, we need properties. Consider:

19.      Pavarotti enjoys singing La Traviata and Giuseppe enjoys it too.

**Gennaro:** If *enjoy* is a relation between people and propositions, then the first clause in (19) says that Pavarotti stands in the enjoy-relation with the proposition *Pavarotti sings La Traviata*; and that is indeed what Pavarotti enjoys. The second clause of (19), then, ought to mean that Giuseppe enjoys that same proposition, namely that Pavarotti sings La Traviata. But that is not so. The most natural reading of the second sentence in (19) is that Giuseppe enjoys singing La Traviata too. On the other hand, if *enjoy* expresses a relation between Pavarotti and the property of singing La Traviata, then the second sentence says that Giuseppe stands in the

enjoy-relation to that same property, which seems right. Moreover, relations like *enjoy* that involve properties are special. They are De Se relations, which are tied to the interpretation of PRO. In (19), Pararotti attributes to himself the property of enjoying singing La Traviata. And transitive intensional verbs, like *want* or *seek* belong to this same cluster of issues.

**Roberta:** Each one of this is a topic in itself! Intensional verbs are hard. Montague (1974) is one of the first proposals on this score, right? The issue is the denotation of such verbs. Although there are proposals, none of them, as far as I know, can explain all the facts. These verbs show the properties of intentionality: their object does not have wide scope, and its existence is not warranted. (20a) may be true even if there is no particular cat that John is looking for; on the other hand, for (20b) to be true, there has to be some particular cat that John is eating:

20.       a. John is looking for a cat  
           b. John is eating a cat.

## 6. Modality

**Gennaro:** The topic of modality is very rich as well. It includes conditionals, modal verbs and adverbs, generics, imperatives.

**Roberta:** We have already introduced Possible world semantics, intensionality, propositions and properties; we have also assumed syntactic structures in the generative tradition. The idea of a PRO, for instance. Now we move to modality. This is a flourishing field of research, with intense and exciting debates going on. And so beautiful. The way it allows us to understand what a possibility is: a way the world could be. It is very much influenced by Kratzer' seminal work (2012) which is something everyone should know. Her proposal treats modal auxiliaries as context sensitive, and it explains the different flavors of modality that might be conveyed by:

21.       Peter must leave.

Peter is obliged to leave, or given the circumstances his best move is to leave. There is a lot to be explored here. This is just a very brief introduction, right?

**Gennaro:** Yes, for we have got to at least mention presuppositions and implicatures, phenomena that kind of cut across among so many different aspects of grammar.

## 7. Presupposition and Implicatures

**Roberta:** Yes, they cut cross all the phenomena we have listed, they are deeply connected to dynamic semantics, and the notion of context, which has already appeared in our discussion of Modality.

**Gennaro:** Yes, presuppositions are ubiquitous. We find them in determiners, embedding, tense... A very beautiful example! Again, what is the set of presuppositional phenomena is largely agreed upon.

**Roberta:** The famous example of the king of France!

**Gennaro:** Yes; and the field of implicatures, particularly quantity implicatures, is also super rich. This is one of the areas that is undergoing a very intense debate.

**Roberta:** There is a lot of experimental work in both these areas. Take the case of factive verbs, the famous case of (22):

22.      a. John stopped smoking.  
          b. John hasn't stopped smoking.

The intuition is that these sentences can only be felicitously uttered in contexts where it is part of the common ground that John used to smoke; both, in other words, presuppose that John used to smoke. However, the presupposition seems to vanish away in contexts such as:

23.      If John has ever smoked, he stopped smoking.

Someone who utters (23) is not committed to the belief that John used to smoke, the speaker conveys that she does not know whether he used to smoke or not. Your 1995 book is devoted to formally account for this phenomenon (known as the projection problem) in a dynamic framework. You have dealt with hard issues such as presuppositions with quantifiers (CHIERCHIA, 1995):

24.      a. Every student parked his bike outside the building.  
          b. Every student who parked his bike illegally got it towed

(24a) seems to presuppose that every student has a bike, whereas in (24b) the presupposition seems to be that some students have a bike.

In your 2013 book you discuss, among other things, implicatures, in particular, quantity implicatures. Since Grice's (1975) famous paper, there is an increasing consensus about quantity implicatures. The idea is that to utter (25) can commit one to the belief that not all of the students passed the exam:

25.      Some students passed the exam.

It is easy to construe (25) as conveying that some but not all students passed. This implied meaning seems to vanish in downward contexts as in (26):

26.      If some students pass the exam, I will be happy.

The speaker will be even happier, if all the students pass the exam. Historically, Grice



was the one who came up with the idea of generalized implicatures as conversational inferences that are normally computed, though they are cancelable (and not attached to a particular item). Horn (1972) made a very important contribution when he detected that the inferential reasoning relied on scales of information. The Gricean reasoning works roughly as follows: We observe that the speaker used ‘some’ when she could have used ‘all’ which is more informative, in a context where both are relevant; this must be so because she does not believe that all the students failed the exam (assuming that she is well informed and cooperative). The derivation of this quantity implicature is common ground nowadays, but there are a number of issues that we have to understand. For instance, are they locally or globally computed?<sup>15</sup> You furthermore claim that implicatures are behind a whole range of other grammatical phenomena, including polarity and factivity in your recent Chierchia (2019).<sup>16</sup>

**Gennaro:** I know. Complicated but interesting things...

**Roberta:** This is just too much! (laughing)

**Gennaro:** Yes, but there is no escape: students have to be introduced to the basics of all the phenomena we just mentioned. What helps is that they are all rooted in robust, and mostly agreed upon sets of phenomena and generalizations.

**Roberta:** The set of phenomena is ok, but what about the formal apparatus? It takes a long training to understand the logical languages.

**Gennaro:** The formal apparatus you build little by little...

What is next? What does one study, after the fundamentals? There is so much interesting stuff out there: We mentioned polarity. But also questions, focus, plurals, mass versus count, bare nouns, incorporation...The study of meaning is making huge progress.

**Roberta:** Thank you!

## References

BARWISE, J.; COOPER, R. Generalized quantifiers and natural language. *Linguistics and Philosophy*, v. 4, p. 159–219, 1981.

BURNETT, H. A delineation solution to the puzzles of absolute adjectives. *Linguistics and Philosophy*, v. 37, p. 1-39, 2014.

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<sup>15</sup> Grice has a global view on implicatures, Chierchia (2017) shows that they must be computed locally, at the CP level. Chemla & Spector (2011) present experimental data that supports the local view.

<sup>16</sup> Pires de Oliveira (2020).

CANÇADO, M.. Posições Argumentais e Propriedades Semânticas. *DELTA. Documentação de Estudos em Linguística Teórica e Aplicada*, São Paulo: PUCSP. v. 21, n.1, p. 23-56, 2005.

CHEMLA, E.; SPECTOR, B. Experimental Evidence for Embedded Scalar Implicatures. *Journal of Semantics*, v. 28, p. 359-400, 2011.

CHIERCHIA, G. Anaphora and attitudes de se. In: BARTSCH, R.; VAN BENTHEM, J.; VAN ENDE BOAS, P. (eds.), *Semantics and Contextual Expression*. Dordrecht: Foris, 1989, p. 1-31.

\_\_\_\_\_. *Dynamics of meaning: anaphora, presupposition, and the theory of grammar*. Chicago: Chicago University Press, 1995.

\_\_\_\_\_. *Semantica, Le Strutture del Linguaggio*, Bologna, Italy: il Mulino, 1997.

\_\_\_\_\_. Plurality of mass nouns and the notion of “semantic parameter”. In: ROTHSTEIN, S. (org.), *Events and grammar*. Springer, Dordrecht, 1998. p. 53-103.

\_\_\_\_\_. Reference to kinds across language. *Natural language semantics*, v. 6, n. 4, p. 339-405, 1998.

\_\_\_\_\_. *Semântica*. Londrina, Campinas: Editora da UEL, Editora da Unicamp, 2003.

\_\_\_\_\_. *Logic in Grammar*. Oxford: Oxford University Press, 2013.

\_\_\_\_\_. Scalar implicatures and their interface with grammar. *Annual Review of Linguistics*, v. 3, p. 245-264, 2017.

\_\_\_\_\_. Factivity meets polarity: On two differences between Italian vs. English factives. In: ALTSHULER, D.; RETT, J. *The Semantics of Focus, Degrees and Times. Essays in honor of Roger Schwarzschild*. New York: Springer, 2019, p. 111-134.

\_\_\_\_\_. Origins of Weak Crossover: when Dynamic Semantics meets Event Semantics. *Natural Language Semantics* [Internet]. 2020; 28 :23–76. Publisher’s Version.

\_\_\_\_\_. Mass vs. Count: Where do we stand? Outline of a theory of semantic variation. In: KISS, T.; PELLETTIER, F. J.; HUSIC, H. (eds), *The Semantics of the Mass/Count Distinction: Recent Developments and Challenges*. Cambridge, UK: Cambridge University Press; Forthcoming.

\_\_\_\_\_. On Being Trivial: Grammar vs. Logic. In: SAGI, G.; WOODS, J. (eds.), *The Semantic Conception of Logic: Essays on Consequence, Invariance, and Meaning*. Cambridge, UK: Cambridge University Press; Forthcoming.

CHIERCHIA, G; MCCONNELL-GINET, S. *Meaning and Grammar. An Introduction to Semantics*. Cambridge: the MIT Press, 1993.

CHIERCHIA G.; PIRES DE OLIVEIRA. Contemporary issues in natural language semantics: An interview with Gennaro Chierchia. *Delta* [Internet]. 2020; 36 (1) :1-25. Publisher's Version.

CRAIN, S. Language acquisition in the absence of experience. *Behavioral and Brain Sciences* v. 14 (4), p. 597-612, 1991.

CRESSWELL, M.J. The semantics of degree. In: PARTEE, B. (ed.). *Montague Grammar*. New York: Academic Press, 1976, p. 261-292.

DAVIDSON, D. The logical form of action sentences. In: RESCHER, N. (ed.), *The Logic of Decision and Action*. Pittsburgh: Pittsburgh University Press, 1967, p. 81-120.

DOWTY, D. *Word Meaning in Montague Grammar*, D. Reidel, Dordrecht, 1978.

FERREIRA, M. *Curso de Semântica Formal*. Berlin: Language Science Press, 2019.

FREGE, G. *Translations from the philosophical writings of Gottlob Frege*. Oxford: Blackwell, 1980.

GEACH, P. *Reference and Generality: An Examination of Some Medieval and Modern Theories*. New York: Ithaca Cornell University Press, 1962.

GRICE, H.P. Logic and conversation. In: COLE, P.; MORGAN, J. (eds.) *Syntax and Semantics*. Volume 3. New York: Academic Press, 1975.

HEIM, I.; KRATZER, A. *Semantics in generative grammar*. Malden: Blackwell, 1998.

HEIM, I. *The Semantics of definite and indefinite NPs*. PhD Dissertation, University of Massachusetts at Amherst, 1982.

HORN, L.R. *On the semantic properties of logical operators in English*. Ph.D. thesis. University of California Los Angeles, 1972.

JACOBSON, P. Towards a Variable-Free Semantics. *Linguistics and Philosophy*, v. 22, n. 2, p. 117-184, 1999.

KAMP, H. Two theories about adjectives. In KEENAN, E. (ed.), *Formal Semantics of Natural Language*. Cambridge: Cambridge University Press, 1975, p.123-155.

\_\_\_\_\_. A Theory of Truth and Semantic Representation, in: GROENENDIJK, J.; JANSSEN, Th.; STOKHOF, M. (eds.). *Formal Methods in the Study of Language*, Mathematisch Centrum, Amsterdam, 1981, p. 277–322.

KEENAN, E.L.; FALTZ, L.M. *Boolean Semantics for natural language*. Dordrecht: D. Reidel.

KENNEDY, C. *Projecting the adjective*. PhD Dissertation. University of California at Santa Cruz, 1997.

KLEIN, E. A semantics for positive and comparative adjectives. *Linguistics and Philosophy*, v. 4, p. 1-45, 1980.

KRATZER, A. *The event argument and the semantics of verbs*. Amherst: BePress, 2002.

\_\_\_\_\_. *Modals and Conditionals. New and Revised Perspectives*. Oxford: Oxford University Press, 2012.

MATTHEWSON, L. Quantification and the nature of crosslinguistic variation. *Natural Language Semantics* 9 (2), p. 145-189, 2001.

MONTAGUE, R. *Formal Philosophy: Selected Papers by Richard Montague*. New Haven: Yale University Press, 1974.

MULLER, A.; BERTUCCI, R. Sintagmas Nominais Nus Expressam a Distinção Definido VS Indefinido?. In: PIRES DE OLIVEIRA, R.; PERUCCHI MEZARI, M. (org.). *Nominais Nus: um olhar através das línguas*. Campinas: Mercado de Letras, 2012, p. 149-184.

PARSONS, T. *Events in the semantics of English: a study in subatomic semantics*. Cambridge: The MIT Press, 1990.

PARTEE, B. H. Noun phrase interpretation and type-shifting principles. In: GROENENDIJK, J.; JANSSEN, Th.; STOKHOF, M. (eds.). *Studies in discourse representation and the theory of generalized quantifiers*. GRASS 8, 1986, p. 115.143.

\_\_\_\_\_. A brief history of the syntax-semantics interface in Western formal linguistics. *Semantics-Syntax Interface* 1.1, p. 1-20, 2014.

PIRES DE OLIVEIRA, R. A conjectura de Chierchia e a logicidade das línguas naturais. *Fórum Linguístico*, v. 17, p. 4701-4713, 2020.

PIRES DE OLIVEIRA, R.; MENDES SOUZA, L. Um rascunho para a semântica de muito: explorando a Semântica de Delineação. *Cadernos de Estudos Linguísticos*, v. 60, p. 222-241, 2018.

QUADROS GOMES, A.P. Línguas Indígenas Brasileiras: O novo campo de provas dos universais linguísticos. *LIAMES*, v. 15, p. 149, 2015