



## Interviews

### Contemporary Issues in Natural Language Semantics: an interview with Gennaro Chierchia

#### *Fronteiras na Semântica das Línguas Naturais: entrevistando Gennaro Chierchia*

Gennaro Chierchia<sup>1</sup>  
Roberta Pires de Oliveira<sup>2,3</sup>

#### RESUMO

*Chierchia explicita seu ponto de vista sobre as principais fronteiras da semântica contemporânea: a multidimensionalidade do significado, a semântica de alternativas, as generalizações de nível médio, a logicidade natural das línguas humanas, o papel da referência e o lugar para as novas metodologias, i.e. experimentos em laboratório.*

**Palavras-chaves:** *multidimensionalidade do significado, semântica de alternativas, generalizações de nível médio, logicidade das línguas naturais, referência, experimentos.*

1. Department of Linguistics - Harvard University. Boston, Massachusetts – Estados Unidos da América. <http://orcid.org/0000-0003-0424-016X>. Email: [chierch@fas.harvard.edu](mailto:chierch@fas.harvard.edu).

2. Universidade Federal de Santa Catarina. Florianópolis, Santa Catarina – Brasil. <http://orcid.org/0000-0002-4946-7205>. Email: [ropiolive@gmail.com](mailto:ropiolive@gmail.com).

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**ABSTRACT**

*Chierchia discusses his views on the frontiers of contemporary semantics: multidimensionality of meaning, alternative semantics, 'mid level' generalizations, the natural logicity of natural languages, the role of reference, and the place of new methodologies, i.e. lab-experiments.*

**Keywords:** *multidimensionality of meaning, alternative semantics, mid level generalizations, logicity of natural languages, reference, experiments.*

Haas Foundations Professor of Linguistics, Professor of Philosophy, Gennaro Chierchia has greatly contributed to Natural Language Semantics not only theoretically in several domains in both linguistics and philosophy – e.g.: *de se* and the interpretation of infinitives (Chierchia 1989), weak crossover (Chierchia 2019a), presuppositions (Chierchia 2019b), implicatures (Chierchia 2013), semantically driven parametric variation in the structure of the Noun Phrase (Chierchia 1998), property theory (Chierchia and Turner 1988), semantic consequences of vagueness (Chierchia 2010), dynamic semantics (Chierchia 1995) -, but also in the education of young linguists and semanticists through his textbooks (Chierchia and McConnell-Ginet 1990, Chierchia 1997, Chierchia 2003, Chierchia 2006). The title of the book in his honor, *From Grammar to Logic* (Caponigro and Cecchetto 2013), highlights one of the main lines of his research: the idea that “a logic (a way of drawing inferences) spontaneously grows and latches on to the syntactic structures produced by our capacity for recursive computation” (Chierchia 2013: 445). His work integrates generative grammar and the tradition of logical studies that culminated with Richard Montague, and was pioneered by Barbara H. Partee.<sup>4</sup> In this interview, he reports his viewpoint on some of the most important issues in Contemporary Semantics, each one of which is undergoing intense research and scrutiny.

Roberta: The first version of this conversation takes place in Brookline, MA, EUA, in 2015. The question was: what do you think are the cutting edge debates in contemporary semantics?

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4. See Partee (2014) for the recent history of natural language semantics.

Chierchia: One, I think, is the radically multidimensional character of meaning. It is an important *discovery* that what we call meaning is the orchestration of different levels of information. Multidimensionality manifests itself in at least six phenomena. Five are uncontroversial, the sixth is rather controversial.

Roberta: What do you mean by multidimensionality of meaning?

Chierchia: In a nutshell, it means that you have alternatives. You never compute just one meaning but a set of ‘parallel’ candidates. One interesting question that arises in this connection is whether there is one of these alternatives that has a ‘privileged’ status or whether the alternatives are all on a par, as it were. First let me mention the phenomena, because that will make the issue clearer. One phenomenon is obviously questions, Questions don’t involve just one proposition.<sup>5</sup> They involve classes of propositions or propositional concepts. To ask who stole the cookies is to ask which member of the set of alternative propositions {a stole the cookies, b stole the cookies,...} is true. Another phenomenon where alternatives most clearly play a role, even more so than in questions, is with focus. When you have focus, like in *I saw JOHN*, you clearly have two things: the ordinary meaning (*I saw John*) and the focus meaning (“of the propositions of the form *I saw a* that we are considering, the true one is that it is John I saw”), or something along those lines. Implicatures, in particular quantity based implicatures, quite clearly fall under this same rubric: use of *some* in, e.g., *I talked to some students* conveys that there is at least one student I talked to and implies that I did not talk to all students. Presuppositions are also a candidate, although that is more controversial, since perhaps they can be handled in a mono-stratal way.

Roberta: As Russell did with definite descriptions?

Chierchia: Yes.

Roberta: On his view, the presupposition of the definite article is then part of the proposition, and not another dimension of meaning.

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5. Dayal (2016)

Chierchia: Yes. In more modern terms, you switch from Classical Logic to a Partial Logic, say to a Strong Kleene Logic<sup>6</sup> and you try to derive presuppositions from that. A proposition  $p$  can be true or false only when its presuppositions are met; if its presuppositions do not hold, it is truth-valueless. So  $p$  presupposes  $q$  if whenever  $p$  has a definite truth value (true or false),  $q$  has to be true. It is possible to go this way. Or you have the Karttunen & Peter's line<sup>7</sup> where you compute in parallel a meaning and its presuppositions in separate dimensions. If you follow this line, then presupposition would be inherently multidimensional. This issue is still open. Yet another phenomenon that is likely to be multidimensional is polarity. Items like *any* or *ever* are 'polarity sensitive': they like to be in a negative environment (you cannot say *I ever liked you*; you have to say *I didn't ever like you*). On one possible take, polarity is intimately related to the semantics of focus and of implicatures.<sup>8</sup> Now one further controversial issue is type-shifting, because it is unclear how it is related to multidimensionality. That there is a certain amount of type shifting seems to be a fact. Nobody can get away completely without it. Take a sentence like *the London office called*. Offices don't really make phone calls; the office staff does. Here *office* is used as a stand in for *office staff*. Perhaps a case of type shifting. The question is: how and when do we use type shifting? The relevant point here is that type shifting too imputes to sentences multiple meanings, in some sense.

Roberta: Multiple possibilities of meaning, I would say. And type shifting may have 'grammaticized' uses. For example, plural predicates, like *dogs* in *those are beautiful dogs* may shift to a 'kind' interpretation when in argument position, as in *dogs are widespread*. Thus, bare nominals are potentially multidimensional.

Chierchia: Yes. Perhaps type shifting in this sense falls under a separate rubric. It is not clear whether it belongs here. But at some level I think it exists.

Now, there are concrete 'technical' issues that come up in connection with multidimensionality: is there a propositional skeleton

6. See Gamut (1991) for strong Kleene logics.

7. Karttunen and Peters (1979).

8. Chierchia (2013).

in the traditional sense at the ‘center’, with alternatives computed on the side? Or are there just alternatives computed in parallel that at some point are integrated in a single meaning? An incarnation of the latter position is Kratzer and Shimoyama<sup>9</sup>, which always works with alternative sets. For example, according to them, the meaning of an indefinite (*a man*) is the sets of candidates for being a man, i.e. the set of men {a, b, c, ...}. These alternatives grow in parallel: *a man walked in* becomes {a walked in, b walked in, ...}. To assert that *a man walked in*, you then need an operator that says roughly that a member of the set {a walked in, b walked in, ...} is true. I don’t think that Kratzer’s and Shimoyama’s framework really escapes multidimensionality because still there is going to be focus anyway, and so you will need to keep track of sets of (focal) alternatives of sets of (assertive) alternatives. At any rate, a choice point in alternative based semantics is: do we *always* work with multi-alternative sets or is there a propositional core and its alternatives?

Roberta: I understand the idea of a proposition and its alternatives, but maybe you could clarify the idea of multi-alternative sets.

Chierchia: Roughly, on the Kratzer and Shimoyama approach you divide labor by having a set of alternatives at the core; then there are operators that are “alternative eaters.” Here is an example: imagine that you want to say

(1) I didn’t see a man.

*A man* would denote the set of men. *I saw a man* would denote the set of propositions of the form I saw a, where a is a man, I saw b, where b is a man..., and then negation would be an “alternative eater.” So it would apply to a set and return a singleton set by disjoining all the propositions and taking their negation. So *I didn’t see a man* winds up having the ‘correct’ meaning *I didn’t see any man*.

Roberta: It is not the case that (I see a or I see b,...)

Chierchia: Yes. The problem I see with this take is that I don’t see any natural way of determining once and for all whether an operator

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9. Kratzer and Shimoyama (2002).

is an ‘alternative eater’. For any candidate operator, you always have the option of composing it ‘pointwise’ instead. When, for example, negation encounters the alternatives ‘I saw a, I saw b, I saw c, ...’ you could imagine composing it with each proposition or you could imagine construing it as an alternative eater, where you say, negation takes the disjunction of its complement and negates that, as we did above. In other words, you can do things in two ways: as we did above, which gives us the singleton in (i), or via pointwise combination which would give us the set of propositions in (ii).

- (i) {not (I saw a or I saw b or...)}
- (ii) {not (I saw a), not (I saw b),...}

I don’t see any natural way of choosing *a priori* between these two ways to go. Give me any operator, say the modal operators box or diamond, i.e. *it must be the case that* vs. *it can be the case that*, and suppose that you know what its ordinary propositional meaning is. For instance, diamond (i.e. *it is possible that*) says there is a possible world in which its complement is true. Now suppose that you want to extend that to a set of propositions. Again, clearly, you can do that in two ways: you can either apply diamond proposition by proposition so that the outcome is a set of propositions: it is possible p, it is possible q, ..., { $\diamond p$ ,  $\diamond q$ , ...}. Or you can construct diamond as something that takes a set of propositions and returns a singleton set mainly: one of these propositions is possible, { $\diamond(p$  or  $q$  or ...)}. And there is no obvious way of choosing between these two ways of composing. If you extend this to conjunction or disjunction, things get even more complex. That’s why I tend not to like this way of going about things.

Roberta: So you think that the idea that we have a single propositional core and alternatives on the side is easier to work with. In the case of (1), we only have the proposition that it is not the case that there is a thing that is a man and that I saw.

Chierchia: Basically, yes.

Roberta: How do we arrive at the proposition?

Chierchia: From the basic meaning of the parts. You compute the propositional core using the traditional approach. Negation is Boolean negation. Diamond is the modal logic diamond...

Roberta: And then you factor in possible extra meanings using the alternatives in the case of phenomena like questions, focus or implicatures.

Chierchia: Exactly. But, as you know, it is ultimately an empirical issue which of the two ways of doing alternative semantics is right.

There is another open technical issue with respect to alternative semantics, namely binding. Is there binding into alternative sets? Suppose that you have a set of alternatives for *a man likes x*. According to Kratzer and Shimoyama that would be the set {a likes x, b likes x, c likes x...}. Now, suppose that you want to abstract over x. How do you do it?

Roberta: That is, you want to have lambda abstraction over a set of alternatives.

Chierchia: Yes, abstraction should apply to each alternative.

Roberta: How?

Chierchia: That's the problem. Kratzer and Shimoyama at some point have a long footnote on this, but Novel and Romero (2010) show that their proposal does not work in the general case. This difficulty constitutes part of the motivation for Inquisitive Semantics<sup>10</sup>. If you have binding, something like  $\lambda$ -abstraction, into a set of alternatives, that is problematic: the alternatives don't have 'variables' in them, each alternative should just be a set of worlds. Binding into sets of alternatives is an open question for everybody. Look, the denotation of {a likes x, b likes x},  $\| \{ a \text{ likes } x, b \text{ likes } x \} \|^g$ , are just two sets of worlds, and you know what they are if you interpret this relative to a particular assignment to variables g: the set of worlds where a likes whatever g assigns to x, and the set of worlds where b likes whatever g assigns to x. Now suppose that you want to write something like

10. <https://projects.illc.uva.nl/inquisitivesemantics/>

$$\boxed{\lambda x.} \left\{ \begin{array}{l} \text{a likes } x \\ \text{b likes } x \end{array} \right\}$$

One would like this to mean this

$$\left\{ \begin{array}{l} \boxed{\lambda x. \text{ a likes } x} \\ \boxed{\lambda x. \text{ b likes } x} \end{array} \right\}$$

But you cannot do this compositionally. That's the problem. Novel and Romero's proposal is that the alternatives are not set of worlds, but functions from assignments to sets of worlds; they are of a more complicated type, and then you can do it.

More in general, the issue is whether alternative semantics has a logic. That's kind of vague in my head, but the model that I have in mind is Karttunen and Peters' treatment of presupposition. That is a multidimensional system, in particular a bi-dimensional one, in which you compute simultaneously the proposition and its presuppositions. Now, that has a logic. It is a four valued logic (see Gamut, 1991: 184), because essentially you have two truth values times two: the proposition can be true or false, and the presupposition can be true or false. So Karttunen and Peters approach can be represented as a four valued logic. The question is whether something like this can be also done for alternative semantics.

Roberta: On Karttunen and Peters' approach you only have what is asserted and the presupposition. But if you have multiple alternatives, the complexity increases exponentially, and you have a problem.

Chierchia: Yes



Roberta: I mean you might have logic for that, but maybe not viable ones.

Chierchia: Or maybe we shouldn't think of alternative based semantics as a logic.

Roberta: Maybe for computers...

Chierchia: Who knows. At any rate, these are clearly important issues. A lot of the action in modern semantics centers around alternatives and how they work. It is one of the new frontiers for us.

Another very active area of research and debate in the study of meaning is one that centers around host of what we might call 'mid level' generalizations. By that I mean a series of theoretically driven empirical generalizations that have emerged over the past twenty years or so. For example, conservativity is a substantive empirical generalization which has been discovered in the 80s; and it is still controversial where it comes from.<sup>11</sup> The definiteness effect is another one. Its existence was long known, but it was in the eighties that interesting semantic accounts for it were put forth.<sup>12</sup> The existence and understanding of adverbial quantification next to the familiar determiner quantification is yet another example. Something like

(2) Few Texans are short.                      Determiner quantification

can be expressed with through adverbs as in:

(3) A Texan is rarely short.                      Adverbial quantification

These two sentences really seem to mean the same thing. In (3) the temporal adverb *rarely* does not quantify over times, but over

11. Conservativity is a property of determiners. A determiner D is conservative iff  $D(A, B) = D(A, AB)$ . As it turns out, all natural language determiners appear to be conservative. Cf. e.g. the discussion in Chierchia and Mc Connell-Ginet (1990), Chapter 9. For a discussion of where conservativity may come from, see Romoli (2010), and references therein.

12. See, e.g. Barwise and Cooper (1981), or Zucchi (1995). The definiteness effect in English shows up with there-sentences. The Noun Phrase that follows the copula in a *there*-sentence has to be indefinites:

- (i) There is a solution/no solution to this problem
- (ii) \* There is every solution/the solution to this problem

individuals, just like the D-quantifier does in (2). Here is another generalization that has come up and has been widely discussed: determiner quantifiers do not always count individuals. Take

- (4) Three thousand ships passed through the lock.

You are not counting individual ships here, you are counting passages, i.e. events. But you are using strictly D-quantification *three thousand ships*, which usually counts individuals. Another significant mid level generalization.

The list of mid level generalizations that keep us pretty busy goes on and is very varied. One more: most indefinite determiners (*a, some*, the numerals) have long distance scope, while strong and negative quantifiers (like *every* or *no*) do not. Here is a relevant contrast

- (5) If I have to examine 2 semantic students, I get very tired.

or

- (6) If 2 relatives of mine die, I get rich

Both sentences contrast with

- (7) If I see no one for the whole week, I get depressed

This last sentence only has one meaning. It does not have the meaning ‘no one is such that if I don’t see him/her in the whole week, I get depressed’.

Roberta: While the other two, namely (5) and (6), have two readings. Something like:

- (i) 2 semantic students are such that if I have to examine them, I get very tired.  
(ii) If there are 2 semantic students that I have to examine, I get very tired.

Chierchia: Yes, there is a clear contrast between the behavior of *two students* versus *no student*. So maybe you get the sense of what I mean by mid level generalizations. And by the way, indefinites like the numerals allow for this long distance interpretation in every

language that I have run into, from Chinese to Hindi. This possibility of indefinites to escape locality of scope assignment is a very widespread property. Notice that it is not just an ambiguity between referential versus quantificational construals. For example:

- (8) Everyone knows that if two relatives of his die he gets rich

This sentence has two readings, but *two relatives* is not referential, because it is inside the scope of *everyone*. Here are the two readings:

- (i) Everyone knows that there are two relatives of his such that if they die he gets rich  
(ii) Everyone knows that if there are two relatives of his that die, he gets rich.

Roberta: Mid level generalizations are empirical generalizations across languages that are not a matter of logic, but are found to hold over and over again in natural languages, and we would like to know why.

Chierchia: Indeed. In some cases we have good hypotheses. We have reasonable theories of indefinites that account for *why* indefinites have long distance scope. I cannot resist mentioning another example: non c-command anaphora. Normally, in every language you get anaphoric links of the type exemplified in the sentence below

- (9) Everyone loves his mom.  
Everyone *x* is such that *x* loves *x* mom.

This is c-command anaphora; and it is reasonably well understood in terms of ordinary variable binding, or something equivalent. But we know that there is a robust set of cases where you get anaphora in absence of c-command, that includes of course donkey anaphora, and inverse linking:

- (10) a. Every teacher that saw a student yesterday told him about the change in schedule  
b. The mayor of no city can afford to ignore its constituency.

In (10a) *a student* covaries with the pronoun *him*, even though there is no c-command between the two. And in (10b), you have this *no city* that, while being deeply embedded, can be assigned scope

outside of the noun-phrase within which it is embedded, so as to get the following interpretation:

- (11) There is no city such that the mayor of it can afford to ignore its constituency.

Some such generalizations are pretty new. They were discovered in the nineties. For instance, the stuff about adverbial quantification or that about long distance indefinites. Those were really discovered in the nineties with all the right diagnostics. Others are older, but they came to be associated with new diagnostics. This is a very good example of a lasting legacy of the past twenty years. It would be crazy to look at a new language, and not take this inventory of generalizations into account. You would have to redo all the work. We understand so little that it is a pity not to exploit what we understand. And of course, tomorrow we are going to change everything in our understanding of these matters, if we have to. But at the same time don't rush too soon to new notions, without checking the diagnostics we know first. But if we have to change our theories, we will.

Another more controversial but important development in semantics, one that I love and I think is fundamental, centers about 'natural logic'. Our grammar is intertwined with a logic, a capacity to draw sound inferences, that grows spontaneously in us. This natural logic may be beginning to yield its main secrets. For example, there are sentences that are perceived as ungrammatical but in fact owe their status not to being not well-formed or ill formed, but to the fact that they are contradictions. You don't know that they are contradictions, but analysis reveals that that is perhaps the only plausible explanation of their status. I find this to be almost like a Copernican revolution.

Roberta: I find it amazing too. It means that our minds are somehow attuned to logic in a very deep sense, even if we don't know it consciously. And it yields a new way of looking at language, and at the grammatical vs. ungrammatical divide. This is what your 2013 book is about, right?

Chierchia: There are many examples that can be made in this connection. A very easy one is 'exceptive' constructions:

- (13) a. # Some students but John hates me.  
b. Every student but John hates me  
c. No student but John hates me

Sentences (13b-c) are sensible. But (13a) is almost a word salad. Why? The best explanation is that (13a) is a contradiction. Here is why. [NP-but-X VP] says that the sentence without the but-phrase is false; but if you take out of the domain of discourse the individual X, it becomes true. So, (13b) says: It is false that every student hates me; but if you take John away from consideration, it becomes true. Now if we apply this procedure to (13a), we get: It is false that some students hate me (i.e. no student hates me). But if you do not consider John, it becomes true. This cannot be. It is inherently contradictory. It seems unavoidable to conclude that that must be why, (13a) sounds weird.<sup>13</sup>

Other types of constructions for which it has been proposed that the source of deviance lies in their being logically trivial (i.e. tautologous or contradictory) are the following.

- (14) # John only weighs more than 60 kilos.

and violations involving negative polarity items, like

- (15) # There are any cookies left

or

- (16) a. If I had managed to sleep a wink, I would feel better.  
b. # If you wouldn't have been so noisy, I would have slept a wink.

Other examples:

- (17) # John is taller than no other boy.

Or

- (18) # There is every solution to this problem.

These are all very good candidates for deviance which should be explained in terms of contradictoriness. Related to this is the difference

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13. von Stechow (1999).

between grammatical and ungrammatical presupposition failures. People tend to generally accept presupposition failures as a source of ungrammaticality, but they shouldn't. Some presupposition failures do not lead to ungrammaticality. It is the same exact problem as with the previous examples. Consider, for example, the sentence below:

(19) The Italian who is not an Italian spoke.

In (19), there is a presupposition failure, since there can't be anybody satisfying that description, but sentence (19) is not perceived as ungrammatical. You tend to impute a sense to it; you tend to interpret it somehow.

Roberta: He is an Italian though he does not act as an Italian, for instance.

Chierchia: Right. But

(20) # John died for an hour.

is ungrammatical, probably a presupposition failure, but an ungrammatical one. Or things like:

(21) # How much doesn't he weigh?

Roberta: So all of these sentences are ungrammatical but not because the syntax does not generate them.

Chierchia: That's the point. On the traditional view ungrammatical meant not generated by syntax. It seems that we have to modify that conception.

Roberta: And you are saying that the examples you just gave are generated by syntax, and hence syntactically well formed, but ruled out by semantics because they are "covert" contradictions, what you call "G-Triviality."

Chierchia: Yes. And this applies to both entailments and presuppositions, and that's important. Many contradictions are not perceived as ungrammatical, for example:

(22) It rains and it does not rain.

(22) is not ungrammatical, but (23) is

(23) # There are any cookies left.

The ‘new’ story, based on G-triviality, is that both (22) and (23) are generated by the syntactic rules; the ungrammaticality of (23) has nothing to do with things like agreement or wrong word order. It stems from its contradictoriness.

Roberta: Do you still want to keep the term ‘ungrammatical’ for this phenomenon?

Chierchia: Yes, in the loose sense that sentences like (23) are not really in the language.

Roberta: Then we get a broader view on what *grammar* means; it is not only syntax in a strict sense, but the deduction system enters into it as well.

Chierchia: Right. Something in the traditional view that has got to go. The traditional view is the Carnapian view, where you have sentences that are generated and sentences (sequences of symbols) that are not generated; the things that are generated are the space of expressions that are meaningful. A different view is: grammar generates well formed expressions, but only a sub-set of those sentences are “truly” grammatical, are “truly” potentially meaningful.<sup>14</sup>

One corollary of this, that at this point in my life I am willing to draw, is that reference and truth conditions play a peripheral role in semantics. I used to believe that semantics was all about reference and truth conditions but now I believe that they are not so central.

Roberta: It really depends on how you understand “reference”.

Chierchia: That’s right.

Roberta: Semantics is not about whether this or that sentence is really true or false, this is not important. But the fact that it has to be either true or false is important.

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14. Carnap (1934/1937).

Chierchia: I agree with you. And this changes the overall picture. It is not reference or actual truth conditions that we should focus on, but *potential* reference, *potential* truth conditions, and that's a matter of logic. What we call referential expressions are expressions that have certain scope properties.

Roberta: We have predicates. *To be married* is a predicate. The way you understand this predicate does not have to be the way I understand it. This is not semantics. But if I know that you think that John is married is true, then I can draw inferences. This is semantics.

Chierchia: That's pretty much adequate. It is not about truth, but about truth preservation. It is not about reference, but about scope properties. Thus, names escape scope, as if they were quantified in, sitting at the 'top' of the derivation. One claim is that the contribution of a name or a demonstrative to truth conditions is just its referent. Now, how do we understand that?

Roberta: I understand that as: a demonstrative is an anchor to some individual in a model. Which individual in what model, this is not semantics.

Chierchia: Yes. So we are not dealing with a 'real' referent.

Roberta: It means that the aim of semantics is to understand what semantic competence is. To my mind, that allows for each one of us having our own concepts, so to say. In a sense, it does not matter how you understand *is married*.

Chierchia: We better have enough in common to understand each other, though.

Roberta: I don't think we run into the problem of not understanding each other, precisely because the logical structures are the same.

Chierchia: That was why originally, semantics developed when it divorced from psychology. I am thinking about the old arguments by Frege and Russell; when Frege is talking about 'thoughts', he is not talking about subjective thoughts.

Roberta: I know, he is talking about this realm of reality that is independent of us. But I don't think we need this.



Chierchia: No, indeed what we need are common structures.

Roberta: I would leave reference to pragmatics, as Chomsky has been saying for a long time.<sup>15</sup>

Chierchia: So, we discussed the multidimensional character of meaning, then mid level universal generalizations that have been unveiled in the past 30 years or so, and we have discussed natural logic. The other great novelty, that I think took shape around the nineties and is still very much happening, is the pursuit of cross-linguistic semantics.<sup>16</sup> Parameters that were studied with some success for a while in syntax take the form of binary choices, like: languages have / do not have X. These choices typically turn out to have important semantic consequences that people began to pursue in the 90s. Other examples are: languages have or do not have overt wh-movement. Languages have or do not have correlatives. Languages have or do not have dual pairs of modal verbs like *can* and *must*. And this extends to extremely basic operators: languages have or do not have dual pairs of words for disjunction and conjunction. This is very interesting and exciting. The idea that languages can get away just with one coordinator and that coordinator can mean disjunction or conjunction depending on the context, but in systematic ways, is fascinating.

Roberta: You mean like in American Sign Language, that has *or*?<sup>17</sup>

Chierchia: Yes. When languages have just one coordinator, it is usually the logically weaker one, namely something like *or*. Then, there is a “strengthening” mechanism that can make it mean *and*. The choice of when to use strengthening may be pragmatic (though that too is structurally conditioned), but the strengthening mechanism in itself is grammatical. Another example of a parameter with important semantic consequences is: languages have / do not have degree variables.<sup>18</sup> And more cases: languages with/without articles; they have or lack determiner quantifiers (as opposed to adverbial quantifiers and, our favorite, they may allow or not allow numbers to combine

15. Chomsky (2013).

16. Matthewson (1997), Chierchia (1998), Dayal (1999), Bittner (1994).

17. Davidson (2011).

18. Kennedy (1997), Beck *et al* (2004).

directly with NPs (in most IndoEuropean languages you can say things like *three cats*; in classifier languages you have to say something like *three units of cat*). Now, all these choice points could be a matter of syntax. For instance, clearly the presence versus the absence of overt *wh*-movement could be a matter of syntax, but these syntactic choices often force a re-structuring of the semantic composition. For some of these phenomena, we may have a better handle than with others, like perhaps in the case of *wh*-movement. Other kinds of choices are less clear; for example, it is not clear to me what kind of parameter is having or not correlatives.<sup>19</sup>

Roberta: So these phenomena are not purely syntactic.

Chierchia: That's right, at least in the sense of 'narrow' syntax. Moreover, some choices may be semantically driven, while others might be syntactically driven, but they still force a change in the interpretative procedure.

Roberta: Correlatives?

Chierchia: Possibly. It is a little bit less understood what sort of parameter 'having correlatives' is as opposed to, say, the presence versus absence of articles.

Roberta: In your 1998 paper you have proposed that the presence vs. absence of articles is semantically driven.

Chierchia: Yes. I proposed the nominal mapping parameter: in some languages nouns are mapped onto predicates. They start their grammatical life as logical predicates; in other languages they are mapped onto kinds. Since kinds are argumental, they don't need a determiner. And so kind oriented languages will tend to lack articles. Eventually, every language has both predicative and referential uses of nouns, but through different derivational paths.<sup>20</sup>

Take, as a further example, the notion of classifier. A candidate is the word *kilo* in *I ate two kilos of apples*. The question is: Do you want

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19. Correlatives are constructions that translated literally would sound as follows:

(a) Which boy saw which girl, that boy danced with that girl.

They are attested in many languages, e.g., Hindi. See on this Dayal (1996).

20. Chierchia (1998), Chierchia (2010).

to say that *kilo* is a classifier in English? Maybe not. In Mandarin, these words have a very specific syntax, different from the one they have in English. Perhaps, classifiers can be thought of as words that can be projected as a specific functional category or just as ordinary nouns.

Roberta: *kilo* is not a classifier in English, but it is in Mandarin, is that it?

Chierchia: Maybe. In English, it has the morphology and largely the distribution of a noun, but not in Mandarin. In Mandarin, it is clearly a functional category. At any rate, the main point here is that the trigger of some of these switches might be semantic, as I have suggested with my ‘nominal mapping parameter’.

Roberta: So this is cross-linguistic semantics...

Chierchia: The main question on the ground, like with other aspects of grammar, is, of course, what are the limits of semantic variation. Some variation in the way we interpret things (i.e. how we map expressions into logical structures) clearly must exist. What are its limits? Here is a very hard manifestation of such a question: is it really true that roots of words (e.g. the root meaning of *cat*, or *swim*, or *hammer*) are neutral vis a vis being a noun versus being a verb? *Swim* can be a noun (as in *my swim yesterday was tiring*) or a verb (as in *you swim in the morning*); similarly for *hammer* (*I don't have a hammer* vs. *I am going to hammer that nail*); even something like *cat* can denote a class of things (namely, cats, as in *we like cats*) or a class of states (As in *we like being cats* = *we like being in a state of being cats*). Probably not really! A more specific manifestation of this question is: is it true that nominal roots are neutral vis a vis count versus mass? Something like *cat* could have a neutral meaning ranging between ‘individual cat’ vs ‘cat-meat’. *Chicken* does work exactly that way. But I don't think that this is really an option for every noun.<sup>21</sup>

Being that as it may, the name of the game here is: the more we can figure out the space of variation in all these domains and what might generate it, the better we can try to ‘reverse – engineer’ from the final state of a specific language to the initial state of the learner.

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21. See the conference *The count-mass distinction: a linguistic misunderstanding?* Bochum, 2018.

We may be able to figure out what is the machine that human children might be endowed with that makes them so successful at language learning. And it is crucial to try to understand things as part of one and the same system, because human nature is largely uniform. So instead of looking in a piecemeal fashion to relative clauses in this language and in that language and stopping there, we try to address the question of what would be a common source of these seemingly very different structures?

Roberta: and make the differences as minimal as possible

Chierchia: Yes

Roberta: Very much in line with Chomsky's program

Chierchia: I think this *is* Chomsky's program. I am far from sure that he would agree with all I said. But this is my way of understanding what he has been trying to do. Clearly, there is a lot of exciting action in this domain. He forced us to rethink a lot of very fundamental questions.

I would like to mention one final thing that is also potentially game changing, namely the birth of theoretically driven experimental linguistics, and, in particular, experimental semantics /pragmatics. We linguists typically work with intuitions of native speakers, and I totally believe in this methodology. I don't think that every intuition must be scrutinized experimentally. Quite frankly, you don't need an experiment to say that *rains* in English is not a sentence. You have to say *it rains*. At the same time, there are many questions that are difficult to assess just with intuitions. For example, the claim that it is harder to compute scalar implicatures in downward entailment contexts, than it is in upward entailing contexts is not a yes or no type of thing; it is a matter of degree, a more or less type of thing.<sup>22</sup> You need quantitative data on this. In some sense the example that I've just mentioned, the embedding of quantity implicatures in downward entailment contexts,

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22. The relevant contrast is between (a) vs. (b):

- (a) If we have the money, we will hire either Sue or Mary
- (b) If we hire either Sue or Mary, we'll do fine

Chierchia alludes to the claim, that it is easier to construe *or* exclusively in sentences like (a), where *or* is embedded in the consequent of a conditional, than in (b), where *or* is embedded in the antecedent of a conditional.

is an issue of processing. One way of looking at it is that in processing a sentence you make certain choices, and the point is that data about your processing choices may be important, because it may reveal features of grammar (like the impact of downward entailing vs. upward entailing contexts). The same goes for acquisition. There are fairly reasonable maps of the acquisition trajectory of certain quantifiers. For example a well-known and much debated case is that of sentences like

(24) Every farmer is riding a horse.

that sometimes children systematically regard it as false when there is a horse that is not ridden by any farmer. That is a common ‘mistake’ that children make and that disappears at some point.<sup>23</sup>

Another well-known example that begins to be reasonably charted is the acquisition path of the binding theory, i.e. the principles that drive the interpretation of reflexive vs. non reflexive pronouns. It seems that children have some version of the relevant principles very early on in their development. They never interpret

(25) Everyone is washing him.

as *everyone is washing himself*; but they do sometimes interpret

(26) John is washing him.

as *John is washing himself*. They do that, however, only for tonic pronouns. They don’t do that for clitic pronouns. So what I am saying is that there is important evidence that comes from how grammatical structures develop in the child that may reveal key properties of the final system.

The real novelty, it seems to me, is in the use of theoretically driven experimental methods in charting these phenomena: acquisition path and processing path. Another new approach, with a similar potential, comes, probably, from neuroscience. Like the experiment that Andrea Moro and his colleagues have done, on the learning of artificial languages.<sup>24</sup> If the artificial language that the participants are

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23. See Inhelder and Piaget (1958), Meroni, Gualmini and Crain (2006), Guasti (2016).

24. Moro (2016).

asked to learn is based on rules that are linguistically plausible, they do it, with effort, but they do it, and that task involves the language areas in the brain. If they are learning an artificial language that does not use linguistically driven rules - imagine a language where to ask a question you move the second word or the third word to the front instead of it being constituent based, they can do that but they recruit areas of the brain not involved in language processing. This is a good example of how neuroscience can shed light on language structure and vice versa.

Roberta: The neural correlations of grammatical phenomena may help us get a better understanding of natural languages.

Chierchia: It is a beginning; still very confusing, very tentative. I find the behavioral data still more solid, at this point. So for instance, the stuff about the binding theory is quite solid. But there begins to be also work on neural activities that correlate with linguistic phenomena that I find very intriguing. Another example I happen to know of is the work by Einat Shetreet<sup>25</sup>, from Tel-Aviv University; she has some interesting neuroimaging results that lead her to make very specific claims on what areas of the brain are involved in implicature generation.

Roberta: This is indeed a very new area. Thank you!

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