

“LOOK UP!” USING EASY WORDS TO EXPLAIN HOW WE LEARN HARD WORDS AND OTHER ASPECTS OF LANGUAGE, AN INTERVIEW WITH LILA GLEITMAN

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Lila Gleitman has fundamentally shaped our understanding of both language, cognition, and the relationship between them. Over her successful career, Lila has done an impressive number of studies establishing that when children learn language they are not simply tracking statistical facts about the sequences of speech sounds, nor are they simply doing a one-to-one mapping between words and possible observable referents in the world. Rather, Lila and her collaborators have demonstrated that, in fact, children can do sophisticated types of symbolic reasoning, as well as learn several aspects of language through the syntactic structure of sentences.

Lila Gleitman is undoubtedly one of the world's foremost experts on language acquisition and

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developmental psycholinguistics. Starting in the 60s, she rose to prominence by bringing experimental methods from psychology to bear on the questions raised by linguistics and philosophers of language, namely how children could learn the rules of a language when there is so much ambiguity both in the language and in the world surrounding them. She has done much work in this vein, focusing both on how children learn words that refer to abstract concepts such as *think* or *believe*, as well as how they acquire concepts when they lack certain inputs, such as in the case of blind or deaf children. Though her contributions and collaborations span many questions and problems in language acquisition, she is perhaps best known for proposing and showing that, from an early age, children are capable of using syntactic cues to learn the meaning of words, particularly verbs (especially those she describes as “hard words” because they are difficult or impossible to observe, like *think*). Through this process, termed *syntactic bootstrapping*, young children would be able rely on the linguistic context in which the words appear to discover aspects of the meanings of words that they don’t know yet (e.g., Landau & Gleitman, 1985; Gleitman, 1990; Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005). More specifically, Lila and her collaborators proposed that syntax could serve as a “zoom lens” allowing language learners to figure out which part of the world is being talked about, which would then help them identify candidate meanings for novel words (e.g., Fisher, Hall, Rakowitz, & Gleitman, 1994).

Lila’s influence on the field of psycholinguistics goes beyond her scientific contributions, to her extraordinary reputation as an advisor and educator. As a result, her influence is perhaps most clearly visible through the success and strong contributions that the students she trained (and the students they went on to train) have made to our field. Lila’s former students include researchers such as Barbara Landau, Susan Goldin-Meadow, Kathy Hirsh-Pasek, Cynthia Fisher, Jesse Snedeker, Jeffrey Lidz, Elissa Newport, Letitia Naigles, Julien Musolino, Toben Mintz, Anna Papafragou, and many others (see for instance some of their work together: Cartmill, Armstrong, Gleitman, Goldin-Meadow, Medina & Trueswell, 2013; Feldman, Goldin-Meadow & Gleitman, 1978; Gleitman, Newport, & Gleitman, 1984; Hirsh-Pasek, Gleitman & Gleitman, 1978; Lidz, Gleitman & Gleitman, 2003; Medina, Snedeker, Trueswell & Gleitman, 2011; Mintz & Gleitman, 2002; Naigles, Gleitman & Gleitman, 1986; Newport, Gleitman & Gleitman, 1977; Papafragou, Cassidy & Gleitman, 2007; Snedeker & Gleitman, 2003).

Lila Gleitman has received numerous awards and recognition for her work and contributions to the fields of psychology, linguistics, and cognitive science, and, as a result, she has been elected as a fellow to many academic societies including (but not limited to) the *American Psychological Association* (APA), the *Association for Psychological Science* (APS), and the *National Academy of Sciences* (NAS). Most recently, she was awarded the David Rumelhart Prize by the Cognitive Science

Society in 2017 in recognition of her contributions to the theoretical foundations of cognition. Though she is a professor emerita of psychology at the University of Pennsylvania, Lila still continues to engage avidly with academia.

Revista Linguística: Lila, first thank you so much for agreeing to be interviewed. This is a real honor for us. We would like to start by asking you a question with regards to the 80's, when you first talked about your hypothesis of how children learn the meanings of words in their language. Already at that time, you proposed that young children could learn word meanings, particularly the meanings of verbs, by paying attention to the syntactic structures in which these words occur. At a time in which experimental studies with young children were rare and most people were still studying what children produce as one of the unique means of estimating what they know, your hypothesis may have earned you a lot of flak from the community. How did you arrive at this counterintuitive hypothesis at a time when people used to think babies would first deal with the sounds of their language, then learn individual words, and only later they would learn how to combine words together and form sentences?

Lila Gleitman: The pleasure is mine! To answer your question, my and Barbara Landau's idea that syntax was involved heavily in word learning came directly from our attempt to study learning in a blind infant (e.g., Landau & Gleitman, 1985). We expected to find many defects and deficits in the blind child's emerging language because they had fewer ways to refer to the world, so imagine our shock, and I should say delight, when we said to a blind two-year-old "Look up!" and the child kept her head immobile and moved her hands towards the air in an exploratory way. She had come for a meaning for *look* and *see* having to do with perceptual exploration and apprehension. How was that done since she could neither look nor see, at least in our sense? And there's where syntax comes in, in which the licensing conditions for words like *look* and *see* and other cognitive and perceptual words are very very different from those like *dog* or *run* or *jump* (see for instance, Gleitman & Trueswell, in press; Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005). That's how it get started, because there had to be some non-magical way to explain how a blind child could understand meanings given perceptual inputs so different from our own.

Revista Linguística: Thirty years later, syntactic bootstrapping is a widely accepted hypothesis supported by many experimental results. Given all the technical advances made by our field and all the discoveries that have been made, what would you describe as the most up-to-date version of the syntactic bootstrapping mechanism for language acquisition? Is there anything that may have made you change your original proposal?

Lila Gleitman: Yes, in the original version of syntactic bootstrapping it was a hypothesis about how one could use the observed structure to reason one's way back to the meaning licensed for such a structure. There had been a previous, very plausible set of hypothesis from Steven Pinker (e.g., Pinker, 1984) and separately Jane Grimshaw (e.g., Grimshaw, 1990, 1994) about how one could acquire the meanings of words from observation and then project the structure from that known meaning. That was called semantic bootstrapping, so these were taken to be two separate procedures, and maybe dueling viewpoints, as to how words were learned. Thirty or forty years later, it's now become clear (or maybe I should say "I believe") that these are linked procedures, that they both apply, and that semantic bootstrapping, for reasons too complicated to describe here, indeed is an initial procedure available to those learning their first words that allows them to construct the representations needed to do later syntactic bootstrapping. Instead of being two opposed points of view about how words are used, which is how I and my colleagues originally conceived it, they are seen today as collateral procedures in which observation is the earliest available procedure and the syntax builds on it later. By later I don't mean when you're three or four years old, I mean 15 or 18 months old.

Revista Linguística: Lila, given that syntactic structure defines the relationships between words in a sentence, and allows listeners to compute the meaning of a sentence from the meaning of the individual words that compose it, a lot of people in the field have thought that infants would first need to learn the words and their meanings, to then be able to learn how to organize words into sentences. But anyone who has read your work and is convinced by the beauty of the arguments, may assume that there is a chicken-and-egg problem in our field: children seem to need words to learn syntax, and need syntax to learn words. How do you think infants could potentially avoid this circularity?

Lila Gleitman: Well, I think I anticipated this question a little bit in my last response. I certainly agree that because the syntax of all languages, while mutually resemblant, is not identical, one has to learn something about the syntax of one's language before one can use it for the purposes we're talking about. I think today this is well documented, that you do learn a few simple words, mostly those that describe whole objects in the world. Thus, simple nouns like *spoon* and *doggy* are used as a scaffold for erecting the syntactic structure which only then can be used in a kind of reverse-engineering to acquire more abstract words (see e.g., Gleitman & Trueswell, *in press*).

Revista Linguística: How do you think children come to find syntax meaningful? Where do you stand in the nature versus nurture debate? Or, in other words what do you think are the ways in which very young children may start gathering the relevant syntactic facts on which to base their acquisition of word meanings ?

Lila Gleitman: Well, I do believe there are some universal and transparent principles at the interface of syntax and semantics. Let me give you a single case. If a concept, let us say the concept “run” has only one-participant, namely the runner, it seems natural that a communication device that expressed “run” would allow one noun phrase to describe that one participant, but if you wanted to say something like “tap” where, for example you might have “John tapping bill,” there are two participants, so you would expect there to be two noun phrases, a transitive sentence rather than the intransitive. And, if you wanted to describe a situation where something or somebody was transferred from person to person or place to place, you would need three noun phrases as in “John gave the book to Mary.” A clue that is perhaps available from the very origins of language learning are these relationships between noun phrase number and the semantics of various verbs. We also know that not all syntactic properties are exhibited in the same way by every language, so one can’t go too far and say that you can use all of the syntax of your natural language from the beginning to learn something about the meaning. This is definitely a step-wise position in which maybe half a dozen principles at the syntax-semantics interface are universal and transparent and therefore available to the infant to start with, and from then on it’s a matter of building on, arm after arm, building more semantics, building more syntax, through the first 5 years of life.

Revista Linguística: What would you describe to be the In(put)s and Out(put)s of syntactic bootstrapping ? What do you think are the most impressive discoveries that were made in this topic and what do you think still remains to be discovered or requires more development?

Lila Gleitman: I was very impressed with cross-linguistic work from Jeff Lidz who began to do cross-linguistic studies in syntactic bootstrapping (e.g., Lidz, Gleitman, & Gleitman, 2003). In our language, as I discussed in the last question, if you’re going to express a causal relation you’re going to have two noun phrases. But, there are other languages which allow some of the noun phrases to be dropped at the surface (sometimes called pro-drop language), so that cue isn’t as reliable and they have alternative morphology that does the same job. Instead of the two noun phrase structure telling you that you have a causal relation, you have morphology that says, “I am a causative verb.” You have that in English, *navigate* or *exemplify*, those suffixes are that sort of thing, but English doesn’t do this very regularly. What Jeff Lidz showed, looking at languages of both types (one that

emphasized morphology and one that emphasized global cues across the sentence) is that children had a preference. Even for those languages where noun phrase number is not as reliable a cue, children seemed to use that cue to learn how to represent new words as if that were somehow a first principle of how a language ought to look despite its unreliability at the surface in their own native language. I found those results very impressive, because, again, they begin to bring this kind of procedure under some kind of principled control. There are lots of possible cues, which ones does a child use, which ones are natural and transparent? That's one of the directions I see research as increasingly going.

***Revista Linguística*: What do you think are the next big questions?**

Lila Gleitman: I think one of the lessons that has come to be taken more and more seriously is that maybe this semantic-syntactic scaffolding, while important (in fact necessary) in a description of language learning, it's also increasingly clear how little of the work they do. What do I mean by that? I mean you better have a pragmatics (or "pragmatics savvy" or however you want to express this) to use language at all, to learn it or use it. The investigation of pragmatics is, I believe, at a much more primitive state than the investigation of syntax and semantics (well I should say syntax). Increasingly that is where research is going, and for reasons just stated, where I think it should go. So how does a person apply common sense to the massive ambiguity and indeterminacy of the language used so as to arrive at a proper interpretation? So that you don't get confused when you see the newspaper and read "Man spends six month in violin case," or "Queen Mary has bottom scraped?" That kind of savvy eludes us very much. Intelligent machines don't seem very good at this sort of problem, whereas humans seem wonderful at it. There's some of course some theory and beginning work about relevance and pragmatic interpretation in general, so that is a huge set of gaps and that's where a lot of present and projected research is probably going.

***Revista Linguística*: How do you choose what questions to tackle?**

Lila Gleitman: I have not so much chosen topics, as had topics thrust upon me by the incredible behavior of first, my own children learning a language, and then those that I have studied. I tried with very many colleagues to say, "Let's change the input to the child's learning and by so doing we'll discover what was necessarily in the input if you were going to learn a language." If you take that away you get deficits, and what wasn't really necessary and so forth. A whole lot of the work I and my colleagues have been involved with has been asking about what the input-output relations are as far as language (as far as word meaning is concerned). What nature kept saying, even in extreme cases like blindness or deafness, or deafness and blindness, is that the child learner seems to rise above the

environment. If you take the environment at all in sensory-perceptual terms, children go way beyond that. There's a kind of independence of the output from the input, but we don't want to be too extreme about that. Everyone knows you learn French if you live in France and English if you live in England, so you're affected by the input in some way, but the subtly and abstractness of that relationship has struck me every time I've worked on a young, human population. That's why I work on that topic.

***Revista Linguística:* When you look back, is there anything you wish you knew earlier or approached differently?**

Lila Gleitman: Well, let me try to give a short answer for once, yes. I wish that I hadn't started out as the most simple minded of empiricists, wasting a great deal of my time and some of the reading time of friends and colleagues in trying to pursue what I now take to be a hopeless cause. Trying to get some simple explanation of how the information that you receive from your mother or father eventuates in language learning. Noam Chomsky in 1959 and afterwards, as well as people before him like Plato, raised these questions in very hard ways, but it's hard to convince people. It was certainly hard to convince me. As I said lots of time spent backing off of hopeless positions, and if I had a do-over maybe I wouldn't be trapped so long in those early positions.

***Revista Linguística:* Lila, you are certainly a source of inspiration for many students, researchers, professors, and so many other people that not only admire your work, but also recognize your role in building the field of language acquisition. You have formed and trained several generations of new researchers (and they have since also formed new generations), and your work has certainly changed the way we have thought about many questions in linguistics and psychology. Do you have a message you would like to send to the new generation of students, researchers, professors that admire your work and hope to contribute as much as you have? Towards which direction(s) do you think they need to go, what are the kind of questions that need to be investigated, what research programs need to be built and pursued? What might be the best approach to study language? Is there anything you think needs to be changed in our field?**

Lila Gleitman: The people that I've had the privilege of working with never were what you would call my students, but my younger colleagues. If students are wise, and professors are wise, that is one thing everybody ought to realize, that you ought to follow the issues where you see them. Following your professor is generally not the most useful option and this is because, really, everybody so far's wrong about everything. People who do the most are people who strike out in new directions

and that's the great part of course of being an academic, is that year after year you run into people who give you new insights all the time. Let me go back to Barbara Landau for one minute. I had with Susan Goldin-Meadow and Heidi Feldman studied a little bit about deaf children in hearing homes who had no way of learning the language around them and had learned to gesture. As this work was evolving, Barbara Landau appeared in our laboratory and said "I would like to study the blind learning language," and I asked her why. She said "Well, as you study the deaf," and I said to her "Yes, and next we'll study people learning language with broken arms," and she said "No there's a good reason to study the blind." And that was the beginning of a lifelong collaboration. As she pointed out, as the deaf have insufficient (or seemingly insufficient input) about the language itself, its sounds and its words, the blind have insufficient or different access to the referential world that language is expressing. Now that seems laughably obvious, not how to study it, but at least that problem in retrospect, but as always it was a so-called "student" who brought this issue dramatically to my attention. That's what we need, this back and forth. That's where the progress comes.

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