LILA R. GLEITMAN

Lila R. Gleitman, president of the Linguistic Society of America (LSA) in 1993, passed away on August 8, 2021, at the end of an inspired and inspiring life in which she mentored generations of students of linguistics and psychology and left an indelible mark on how we think about the acquisition of language. She began her academic career at Swarthmore College in 1969 and spent many years at the University of Pennsylvania, first in the School of Education as the William T. Carter Professor of Education, beginning in 1972, and later in the Department of Psychology as the Steven and Marcia Roth Professor of Psychology, with an additional appointment in Linguistics. She retired from Penn in 2001, but maintained a high level of engagement in research both at Penn and as a member of the Center for Cognitive Science at Rutgers University.[1]

Her career was capped by professional recognition of every sort. She was a fellow of both AAASs (the American Association for the Advancement of Science, and the American Academy of Arts and Sciences) and of the National Academy of Sciences, as well as of the Linguistic Society of America and the American Psychological Association, the Association for Psychological Science, and the Society of Experimental Psychologists.

Lila was born Leila Ruth Lichtenberg on December 10, 1929 (she later chose to give up the 'e' in 'Leila' because it was too hard to spell), and grew up in Sheepshead Bay in Brooklyn, NY. She attended James Madison High School, a local public high school that was also home to United States Supreme Court Justice Ruth Bader Ginsburg. To know Lila was to know that she was from Brooklyn. It was hard to miss: her cadence, her vowels, and her almost-too-fast-to-be-human wit. To those who encountered her professionally, her deep intellectual engagement was manifest, and to those who had the chance to know her personally, her warmth and human caring for those around her was legendary. Anyone who read her papers could appreciate her dry wit. When she described a new experimental method that she ran on college sophomores, she wrote, 'While we would not want to exaggerate the conceptual sophistication of these subjects … '.[2]

She was of a generation in which women were not encouraged to enter the professions. She graduated from Antioch College in 1952 and moved back to New York, where her first job was as a Gal Friday for the *Journal of the American Water Works Association*, after being editor of Antioch's college magazine, *Idiom*. The times were such that neither she nor her associate editor at *Idiom*—who was subordinate to her at *Idiom* but had the advantage of being a male—found it odd that she got the Gal Friday job and he got an assistant editor job at Doubleday Publishers. She and Eugene Galanter, a young psychologist at Penn who would be one of the early movers in cognitive psychology, were soon married and, as a faculty wife, she was free to study anything she wanted at Penn, so she signed up to study Classical Greek. This decision brought her to Henry Hoenigswald (president of the LSA in 1958). Hoenigswald took her aside and told her that he could see that what she really wanted to study was a field known as 'linguistics'.

[1] We are grateful for comments from Lila's daughters, Ellen and Claire, on an earlier version.

[2] Gillette et al. 1999, Gleitman 2020:384. Throughout, we cite the appearance of the original article, but additionally give page numbers corresponding to the appearance of the articles in Lila's final book, Gleitman 2020, hoping that this will be of greatest convenience to the reader.

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Acting on Hoenigswald's advice, she went to meet Zellig Harris (president of the LSA in 1955) over in the Department of Linguistics. Harris encouraged her to join his group. There was nothing that he could recommend to her to read about linguistics, but he said that she should go to Florence once a year to gaze upon Michelangelo's *David*.

This began a period in which she worked closely with Harris, who was developing transformational grammar and computational applications of his theory. There were still close ties, both personal and professional, between Penn and MIT during this period, and Lila became friends and professional colleagues with Noam Chomsky, a bond that would last for six decades. Lila set out upon a path that began with the study of symmetric predicates, reflexives, and coordinating conjunctions, leading to her first publication in linguistics (1965 in *Language*), and these interests remained among the topics she pursued for decades. Her work showed the impact of Zellig Harris's perspective in the way she explored the range of alternative syntactic structures that a single lexical item could appear in. But she found Chomsky's theoretical framework more congenial than Harris's. Lila was always the first to note that Harris's way of thinking deeply influenced her, though by the time she produced her dissertation, the two were no longer working together. She often noted that one of her inventions that guided her research, which she called 'The great verb game', was directly inspired by her understanding of Harris's vision of language.

In 1967, Lila—who was by then Lila Gleitman, having married Henry Gleitman in the Psych Department at Penn in 1958 ('without malice aforethought, I swapped out my interesting first husband for the love of my life', she later wrote[3])—completed her Ph.D. in linguistics, and published in 1970 her first book, *Phrase and paraphrase*, co-authored with Henry (Gleitman & Gleitman 1970).

In 1969, she began teaching linguistics at Swarthmore College. She was already engaged professionally with the graduate students in psychology at Penn, and had opened her home with Henry in Merion Station to graduate students every week for regular discussions of cognitive psychology, facilitated by wine and cheese. In 1972, she moved to the University of Pennsylvania. One of us (JG) was a seventeen-year-old student in her first linguistics course, at Swarthmore. She asked us to call her on the phone before class to remind her to bring in a book she had offered to lend. 'Professor Gleitman, this is John Goldsmith, from your linguistics class,' I began. Lila paused just a moment, and replied, 'John, what does it take to be on a first name basis with you?'.

Lila's vision of language led her to work on the hard problem of language acquisition: how to account for the vast extent and complexity of what each of us has learned about our native language, on the one hand, juxtaposed with the capacities and ideas we have that precede, both logically and chronologically, our experience with language, on the other. It was often the latter—what humans come to language learning already knowing—that seemed to take the upper hand in telling the story, but that is largely because it takes a lot of work to show that a child has learned something they have not been taught, and she was willing to do that work. Nonetheless, Lila's leaning toward nativism was equally matched by her recognition that the child's actual ability to learn a particular language is just as astonishing as the child's knowledge before learning. And this learning happens early. When her daughter Claire was only two, Lila said to her, 'Hold on tight,' as they approached a sudden stop, and Claire replied, 'Isn't it tightly?'.

[3] Lila's remark appears in Gleitman & Gleitman 2022, which captures Lila's wit and her broad intellectual vision.

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In the 1970s, along with her collaborators (notably Henry Gleitman and Paul Rozin), Lila explored the relationship between the knowledge and abilities that a native speaker displays in speech and comprehension, and the ability speakers have to reflect on that knowledge, in particular. The ability to reflect on language plays a role in three sets of skills that Lila made significant contributions to: the ability to assign grammaticality judgments to sentences, the ability to paraphrase phrases or sentences (especially those involving sentences that put meanings together in unexpected ways), and the ability to gain access to the phonemes of a word in order to learn to read an alphabetic system, which relies on sounds rather than meanings.

In *Phrase and paraphrase* (Gleitman & Gleitman 1970), Lila showed that office temps were overwhelmingly less good at paraphrasing unexpected three-word compounds and phrases (like *house black-bird* or *bird house-black*) than college students were. Lila proposed that this behavioral difference is due to the fact that the paraphrase task requires a META-ABILITY that is different from garden-variety knowledge of, and skill with, English. She suggested that weakness in such a metalinguistic skill might be the reason some children had difficulty learning to read an alphabetic system. She ran studies to show that the same children who were not succeeding in learning to read alphabetically could learn to read in ideographic representation (like Chinese) or in a syllabary-based representation—both of which require a less challenging metalinguistic capacity than an alphabetic representation does.

The significance of metalinguistic capacity returned when, later in her career, Lila turned to recent studies on linguistic relativity (often referred to as the Whorfian hypothesis). In partnership with Anna Papafragou, Lila proposed a reinterpretation of the results in the published literature, which provide mixed findings about the influence of a speaker's language on decision tasks (Gleitman & Papafragou 2005). Lila saw language as underdetermining the conceptual ideas it conveys—language is 'sketchy' compared to the richness of our thoughts. She showed that experimental designs requiring participants to use linguistic categories as an essential part of the task lead to effects that can be traced to categorial distinctions in the speaker's native language. But absent the need to use a particular language to complete the experimental task, participants are not restricted or hampered in any way by categories that may or may not exist in their language. Lila thus carved out an intermediate position between Benjamin Lee Whorf and Edward Sapir, who argue that language has an impact on thought even when we are not engaged in languaging, and the skeptical position, which doubts that language has any impact on cognition at all.

Toward the end of the 1970s, Lila's research focus turned to the study of the language directed to children in order to better understand the degree to which the child's development of an internal grammar depended on outside causes (such as a special kind of sentence structure offered to children by their parents) vs. internal developmental and maturational forces. Henry Gleitman suggested that the speech directed to young child should be dubbed 'Motherese', and a new technical term was born (Newport, Gleitman, & Gleitman 1977, Gleitman 2020:141–77). The Gleitmans, in partnership with Elissa Newport, found that 'the properties of Motherese derive largely from the fact that the mother wants her child to do as he is told right now, and very little from the fact that she wants him to become a fluent speaker in the future' (ibid., 144). They found that 'the speech of mothers to children is unswervingly well formed' (ibid., 150), but brief and to the functional point. (See also Newport 1977, Gleitman et al. 1984.)

The task for the scientist is to discover the aspects of Motherese that have an impact on the language the child learns. Lila did this by determining whether differences across

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mothers' speech at one moment in time are related to differences in their children's speech at a later time. The first finding was that some properties of maternal input do have an effect on later child language: mothers who produced many sentences that BEGAN with an auxiliary verb at one time tended to have children who produced many auxiliary verbs in their speech at a later time. The auxiliary thus appears to be a linguistic property that is SENSITIVE to variation in linguistic input. But this is not the whole story—when children first began to produce auxiliaries, they produced them in post-subject position, not at the beginning of their sentences, even though auxiliaries in the first position of their mothers' sentences had the biggest impact on their auxiliary development. Child speech does indeed reflect aspects of Motherese, but in conjunction with aspects of the child's internally developing grammar. Children learn the salience and importance of using auxiliary verbs from the Motherese they hear, rich in inverted auxiliaries. But they know to put their auxiliary verbs where they ought to be (after the subject NP) because of the grammar they are developing.

Lila also found that some properties of language were NOT affected by the measurable properties of the utterances in Motherese—the number of noun arguments and the number of verbs a mother produced at one moment did NOT predict the number found in her child's sentences at a later time. But, of course, the evidence for these input-INSENSITIVE properties is negative: that is, it is the absence of an effect that identifies these properties as being insensitive to linguistic input. This null effect might well be real, but it needs bolstering from other data to be conclusive. That bolstering came from Lila's next set of studies.

Along with Heidi Feldman and Susan Goldin-Meadow, Lila began to study the creation of language systems by deaf children whose hearing losses prevented them from acquiring spoken English, and whose hearing parents had not exposed them to an established sign language, such as American Sign Language. These children were surrounded by a world of loving parents, but they did not have access to a language they could learn. These are not circumstances conducive to language learning, particularly if we imagine that the child is the one doing the learning. But COMMUNICATION is not inhibited in this unusual context, and the system of communication that arises in these cases is one in which the child plays the leading role. The child does communicate, and uses gesture to do so. Lila and her colleagues found that the gestures these deaf children create to communicate with their hearing family members—called HOMESIGNS—contained many properties found in natural languages, both signed and spoken. A linguistic property found in homesign is positive evidence for aspects of the child's language that emerge in the ABSENCE of linguistic input. And, indeed, homesigners produced gestural sentences characterized by argument structures containing different numbers of nouns, and gesture sentences containing multiple verbs—both input-INSENSITIVE properties in Lila's studies of Motherese. These converging findings across radically different paradigms add weight to the conclusions.

In one of the last papers Lila wrote, she returned to homesign to explore the innateness of symmetrical and reciprocal constructions. Many languages mark the distinction between these constructions. In this context, we take 'symmetrical' relationships to be those in which if A verbs B, then B necessarily verbs A, whereas 'reciprocal' relationships are those in which the two relationships may hold, but not because of the meaning of the verb or adjective in question. 'Looks like' and 'marry' (in its most common sense, where the agent of the sentence is not the minister) are symmetrical, while 'kiss' is not, though reciprocal kissing is extremely common in real life. In English, we can use *each other* with a symmetrical relation, but we do not have to—we can say either *Bert and Ernie high-*

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fived or *Bert and Ernie high-fived each other*. However, we must include e*ach other* when talking about a reciprocal relation—*Bert and Ernie punched each other*, not *Bert and Ernie punched*. Do homesigners make this distinction? Lila showed that at least some homesigners use mirrored forms to represent symmetrical relations (e.g. two palms coming together in front of the chest to convey two people high-fiving), but nonmirrored forms to represent reciprocal relations (e.g. one fist moving away from the body, followed by a second fist moving toward the body, to convey two people simultaneously punching each other). The distinction between symmetrical and reciprocal relations is so important to human language that homesigners will use a form for reciprocals that distorts the actual event—two sequential gestures representing a single, simultaneous event—in order to avoid using the same form for both types of relations (Gleitman et al. 2019, Gleitman 2020:790–808).

Lila's GREAT VERB GAME was based on a simple but surprising fact: knowledge of the set of selectional frames a verb enjoys is often enough to identify the verb, in a Harrisian way. If you are told that *A verb-ed B from C*, and that this is (more or less) a paraphrase of *A verb-ed C from B*, as well as a paraphrase of *A verb-ed B and C*, you are likely to quickly divine that the verb is *separate*, or another verb with almost the same meaning. In Lila's hands, this game morphed from an observation about verbs to a hypothesis about how syntax can serve as the royal road to learning semantics and argument structure.

In work with Barbara Landau, Lila explored the mind and the language of blind children, and found that blind children did not perform as John Locke had expected them to. John Locke notwithstanding, two- and three-year-old blind children use the words *look* and *see*, and use them correctly as perception verbs. Under their interpretation, the words cover the familiar cases of looking and seeing when the verbs' subject is a sighted person, but the words also allow the blind child to be their subject. When the child is told to look up, rather than crane her neck backward, as a sighted child would, the child raises her arms up; looking, from the blind child's point of view, involves an active perception through the best medium the child has, which is tactile. The blind child can respond appropriately to the command, 'You may touch but you may not look at the table'—the child taps the table, but does not explore the surface with her hands. How did the blind child figure out these meanings? Like all children, blind children hear words in sentence frames. Those sentence frames can guide the child toward a set of meanings, guidance that is particularly helpful if the child has to rely on touch to figure out a word's meaning. But this process is not unique to blind children.

A good deal of Lila's work on language acquisition entered into a conversation with philosophers, and with a special trio: Plato, Locke, and Hume. In this conversation, she upheld the view (often associated with positivists, though that seems surprising in this particular case) that philosophy can very often be improved, and even replaced, by the methods of science. But the science would have to be done RIGHT: she harpooned and lambasted psychologists who too glibly assumed that word learning could be accomplished through a probabilistic alignment of objects in the ambient world of the child with the words the child hears, simply by showing that the psychologists had not really thought through the consequences of what they attributed to the child.

A physical description of the world around the child is both too rich and too limited to serve as the basis for a statistical method to align words to objects and actions, but 'syntax acts as a kind of mental zoom lens for fixing on just the interpretation, among these possible ones, that the speaker is expressing. To make use of this information source in acquiring the verb vocabulary, the learner must perform a sentence-to-world

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mapping rather than a word-to-world mapping' (Gleitman 1990, 2020:281). And she believed this early on—her daughter Ellen noted a discrepancy between a picture (of one lion) and the words describing it (*lions roar*) and asked her mom which was correct, the picture or the words. True to form, Lila said, 'the words'. Lila showed that, once the uses of a verb are organized by the syntactic frames in which they occur, it is much easier for children to align those uses with their immediate experiences. Lila and Barbara Landau called this process SYNTACTIC BOOTSTRAPPING (Gleitman 1990, 2020:284).

Over the course of Lila's research measured in decades, syntactic bootstrapping developed greater form and articulation. Nouns—some nouns—could be learned first. Once nouns were learned, that knowledge, along with the child's evolving understanding of the alignment of syntactic patterns and argument structure, allowed the child to develop an understanding of the meaning of verbs. The task of verb learning for the child becomes possible only after noun learning has progressed sufficiently (Gillette et al. 1999, Gleitman 2020:383). This is true, in part, because verbs describe relations among objects in many cases, and because awareness of the referents of nouns helps the child zero in on the focus and intent of the speaker.

One of Lila's most remarkable experimental designs used college sophomores to provide something like an upper bound on what a child could learn about the meaning of a noun or verb just from hearing the word during an interaction with their mother, and with no linguistic cues. She called this the HUMAN SIMULATION PARADIGM. It is carried out by playing a short video with the sound turned off of a mother and a child interacting, but with a beep at the precise moment when the mother uttered a word ('shoe', 'jump', or 'get', etc.). The sophomores do relatively poorly at guessing the noun the mother has said, and they do much worse on verbs.

There are all sorts of reasons why this paradigm is immensely clever, not the least of which is that poor achievement on the part of the guesser to identify a verb cannot be attributed to the guesser's not yet having grasped the concept. It turns out that it is not the noun/verb distinction per se that is most important; it is rather the imageability of the word—how possible it is to draw a mental picture of the meaning of the word, and this, to be sure, is much more possible for nouns than for verbs, overall.

One of the central questions for Lila in these studies was what information about language allowed the child to see that a particular verb was about the content of someone's consciousness (like *think S*, or *want VP*), rather than being directly about objects or actions in the world. The answer is almost there already when the question is correctly posed: the crucial information is that these verbs appear (sometimes) with clausal complements, and in this very important sense, surface subcategorizations provide the learner with important information that leads to conceptual insights. In the case of *think* or *know*, for example, an extremely common use involves an explanation of someone's surprising behavior that is based on a false belief (*Oh, I didn't know you were here*), generally allowing or requiring a clausal complement.

Lila and her colleagues used the human simulation paradigm to zoom in on experiences that are most successful in helping the child to learn a word. Not all experiences are equally useful, and her studies helped to establish that attention SHARED by the child and an adult on an object just before the word for that object is produced is most important among the factors that influence the child's success in inferring the meaning of a word for that object. She called these especially helpful contexts 'gems', and she was able to identify, using the human simulation paradigm, the appearance of such gems in the daily life of a child. She determined how easy or hard it was for college sophomores to guess the parent's beeped-out word—some parents had more easily guessed words,

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more gems, in their repertoires than others. And the parents who produced many gems early in a child's development had children who produced more words later in development than parents who produced few gems early in development. This pattern provides strong evidence that it is the appearance of these gems in parental input that sets the child off on a quicker path toward mastery of vocabulary.

These gems reflect the QUALITY of the child's linguistic input. One of Lila's important findings is that quality of parent speech did not correlate with quantity of parent speech. In other words, parents who talked more to their children did not, as a group, provide their children with proportionally more high-quality word-learning instances. And quality and quantity did not predict child vocabulary outcome in the same way—each accounted for different aspects of later child vocabulary. Finally, and most striking, even though the amount of talk children heard from their parents (the QUANTITY of parent speech) was correlated with socioeconomic status, the rate at which gems appeared in a parent's speech (the QUALITY of parent speech) was not correlated with socioeconomic status (Cartmill et al. 2013, Gleitman 2020:626–28). It is not just how much a parent talks—the way in which the parent presents words to a child also matters for learning.

Lila was a scholar who changed the field with her scholarship. But she also changed the field with her teaching and mentorship. Lila had a deep understanding of the important questions and the theoretical implications behind those questions—and she shared that with her students (and colleagues). She maintained a belief that we should be able to address these questions with experimental studies, particularly studies that were cleverly and cleanly designed (which Henry helped with). Lila never stopped being interested in the answers to these questions. She worked tirelessly until she was ninety-one and was writing an abstract in the hospital the day before she died—she wanted to know the answers, and inspired that passion in generations of scholars. We all loved everything about her—the twinkle in her eye as she was about to say the wittiest thing you could possibly imagine, the incisiveness of her comments (even though they were likely to deflate your argument), the generosity of her thinking. Who could ask for a better mentor and friend? But she's not gone. She is alive in the minds and hearts of all of the many, many students, colleagues, and friends that she touched—and, of course, in Claire and Ellen, her daughters and favorite language-learners. [JOHN A. GOLDSMITH, *The University of Chicago*, goldsmith@uchicago.edu; and SUSAN GOLDIN-MEADOW, *The University of Chicago*, sgm@uchicago.edu]

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