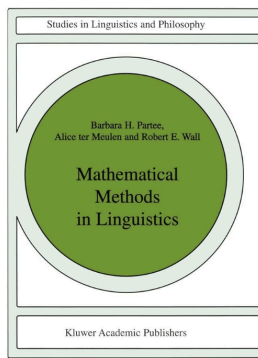


What is Mathematical Linguistics?



“mathematical modeling of linguistic theory”

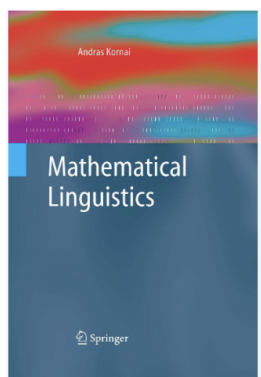
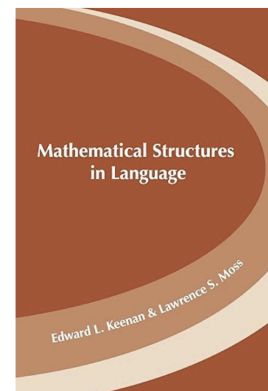
–Barbara Partee (Swarthmore alum!), quoted in Iacobo (2020)

Partee’s syllabus for Mathematical Linguistics begins with this: “Note: a more accurate title for this course might be ‘mathematics in and for linguistics’; the term ‘mathematical linguistics’ now mostly refers to ‘formal language theory’.”

ter Meulen (2012)’s entry for the *Oxford Bibliographies in Linguistics*: “Mathematical linguistics is a field of scientific linguistic inquiry applying mathematical methods and concepts to linguistic systems, to phenomena observed in natural languages, or to the metatheory of models of grammars.”

Includes many references focused on the formal properties of grammars (independent of their application to natural languages), as well as the early works by Chomsky that they informed.

Keenan and Moss (2016): “introduces a number of mathematical concepts that are of interest to the working linguist. The areas covered include basic set theory and logic, formal languages and automata, trees, partial orders, lattices, Boolean structure, generalized quantifier theory, and linguistic invariants.”



Kornai (2010:1): “many parts of the subject would fit nicely in algebra and logic, but there are many others for which methods belonging to other fields of mathematics are more appropriate. Ultimately the coherence of the field, such as it is, depends on the coherence of linguistics.”

In practice, what does mathematical linguistics research look like?

In Phonology...

- Computational complexity: finite-state representations of OT grammars
- Local evaluation of hierarchical constraints:

```
[voice]o(x) = if [nasal] (p(x)) then
                if ¬[son] (x) then FALSE
                else [voice] (x)
```

- The UR→SR mapping as a **function**.
 - How can we learn these from positive data?

In Syntax.....

- Collins and Stabler (2016)'s formalization of Minimalism
- *Mathematical Structure of Syntactic Merge: An Algebraic Model for Generative Linguistics* (2025), Matilde Marcolli, Noam Chomsky, and Robert C. Berwick

In Semantics....

- Shizhe?

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