Preface

This book aims to show that it is possible to accumulate knowledge about the language faculty by the basic scientific method, i.e., by deducing definite predictions from our hypotheses and obtaining and replicating experimental results precisely in line with such predictions, as is done in other scientific disciplines such as physics (what we may call "the method of exact science"). We call this endeavor Language Faculty Science, LFS for short. Modern linguistics has often been said to be a scientific study of language, and indeed essentially every introductory linguistics textbook makes some version of this claim. It is rather rare, however, that we find serious or in-depth discussion in such books about what is meant by "language" and what kind of activities are involved in "science".

It is doubtful that every phenomenon having to do with language can be studied by a method of exact science analogous to that of physics. In order to determine what linguistic phenomena can be studied by such a method, it is necessary first to understand what kinds of activities are involved in "science" and what kinds of problems will have to be dealt with in order to apply the scientific method to linguistic phenomena and obtain meaningful results. Since the earliest days of generative grammar, Chomsky has maintained that we must study linguistic competence as natural scientists study their subject matters, claiming that it is possible to do so.[1]

What do we mean by linguistic competence? Barring any serious impairment, every member of the human species is able to produce and comprehend the language(s) to which they are exposed. Underlying this ability of ours to relate linguistic form, i.e., sounds/signs, and meaning is the language faculty. It is hypothesized that the language faculty in its initial state (sometimes called Universal Grammar) is uniform across the members of the species and, in its steady state (sometimes called a person's I-language), where its "maturational" growth has stopped, it varies in accordance with one's linguistic experience, within the limit imposed by the genetic endowment. I in I-language stands for "internal" and "individual" (Chomsky 1995: 13 and elsewhere). The basic property common to all I-languages that has so far been studied by the method of exact science is the human computational ability to handle the "discrete infinity" of language, that is, to relate finite sounds and signs to infinite number of sentences with forms and meaning. Other aspects of the linguistic competence seem to involve too many variables for this purpose, and as such, none of them seem to have been

1 See Section 3 of the introduction to Chomsky (1975), drawn from an unpublished 1955–56 manuscript.

https://doi.org/10.1515/9783110724790-203

isolated in ways that would make them suitable objects of inquiry for research that pursues the method of exact science.

The concept Merge, which has been proposed for the purpose of accounting for discrete infinity (via the imposition of hierarchical structures) is an operation that combines two elements, each having form and meaning, and forms one; its recursive application makes it possible to generate recursively enumerable hierarchical structures. This conceptualization can be understood as an accomplishment of the generative enterprise, which Chomsky founded as an attempt to pursue linguistic research as a scientific discipline. One might, however, reasonably suggest that the existence of recursive Merge and the hierarchical structures that arise due to its application, though they have been *assumed*, have never been (thought possible to be) subjected to the empirical testing via the method of exact science

This volume is concerned with the demonstration of the existence of c-command, i.e., the detection of c-command effects, so as to demonstrate the existence of recursive Merge. The concept of c-command itself was proposed in the 1970s, and its critical relevance/significance has been recognized in relation to the phenomenon of bound variable anaphora (BVA), among other phenomena. With the understanding that it is defined in terms of Merge, c-command is now redefined as a more restricted concept. "x c-commanding y" is defined as in (1) by using Merge.

(1) x c-commands y iff x is merged with z that contains y,
z contains y iff
(i) X and Y are the daughters of Z iff Z={X,Y}
(ii) X contains Y iff:
a. Y is X's daughter or
b. Y is the daughter of an element Z that X contains.

x c-commands y iff y is a member of a set Z that is merged with x or y is a member of a subset of Z (or a subset of a subset of Z, etc.). The c-command relation is thus defined to hold between x and y only when Merge is recursively applied. In short, if we can show the existence of a phenomenon, such as a meaning relation between two elements that can arise only if there is a c-command relation between them, that constitutes the demonstration of recursive Merge. Identification/determination of properties of the computational system of natural language, which maps the form of sounds and signs to that of meaning, follows from such a demonstration. In other words, if we can identify phenomena that require c-command, that opens up a path for empirically testing the hypothesis about the existence of recursive Merge. In this volume, we refer to the theoretical and experimental identification of a c-command (accompanied by rigorous testability) as "c-command detection".

C-command detection can be a tool for empirically testing the thesis that recursive Merge exists at the core of the computational system of the human language.

It has in fact been argued that for the variable-binding relation to obtain between X and Y, it is necessary for X to c-command Y. The existence of similar formal relations has been entertained in relation to distributive readings and coreference. Let us notate such meaning relations between X and Y as MR(X, Y). The attempt to establish the link between meaning relations and formal/structural constraints can be understood, from the current perspective, as an attempt at c-command detection. Since the identification of the acceptability of relevant meaning relations is based on native speaker judgments, however, the inherent variability of such judgments poses a perpetual problem. This includes the question of what the sources of such variation might be. If X c-commanding Y is a necessary condition for a given MR(X, Y), a sentence in which X does not c-command Y must necessarily be judged unacceptable under the MR in question; a structural relation like c-command either holds or does not hold, leading to a categorical distinction. In reality, however, there are cases where the aggregate judgments on the availability of a given MR in a given sentence are not categorical, pointing to the possibility that there are sources for MR(X, Y) other than c-command (with the variance in judgments attributable to variance in these other, non-command sources). Unless we successfully exclude the possibility of such non-c-command sources for MR(X, Y), c-command detection cannot be attained. The aim of this volume is to articulate how this is possible and thereby to argue that LFS as an exact science is possible.

The volume consists of ten chapters, organized in the following three parts.

Part 1: The Past History of our Attempts to Detect C-command
Part 2: The Correlational Approach
Part 3: LFS as an Exact Science

Part 1, "The Past History of our Attempts to Detect C-command", addresses how c-command detection was attempted in past works, pointing out its shortcomings, and suggesting solutions to the problems. Chapter 1 discusses works from 1985 to 2015 by Hajime Hoji, who has proposed the methodology pursued in this volume and is one of the three co-editors. The chapter explains, based on concrete illustration, how and why his attempts for c-command detection in those works fell short of being an instance of exact science. Though he does not go so far as to say this, I believe that problems pointed out and suggested solutions given in the chapter are equally applicable to works by researchers other than Hoji.

Chapter 2 can be understood as our initial attempts to identify non-formal sources of the BVA(X, Y) interpretation, that is, BVA(X, Y) interpretations that are possible despite X not c-commanding Y. This phenomenon has been called

"Quirky binding" and it has been recognized as posing a problem when we try to use BVA for c-command detection. This chapter is written by Ayumi Ueyama, who gave the first systematic account of this phenomenon in her dissertation. The chapter is based on Appendix D of her 1998 dissertation (Ueyama 1998). A close analysis of this phenomenon is a necessary step for understanding what must be controlled for in order to use BVA for c-command detection.

Chapter 3 presents, based on Chapters 1 and 2, a detailed illustration of the experimental method pursued in the Hoji research group up to 2015. The chapter does not (directly) address predicted *correlations* of judgments, which figure prominently in the approach pursued in the remainder of the volume, but it offers the reader basic knowledge for understanding how experiments can be conducted without the use of such correlations and what their limitations are.

Part 2, "The Correlational Approach", based on Part 1, provides a methodology for carrying out LFS research and presents actual research results. Chapter 4 addresses the basic tenets of the correlational methodology and how it can be put to practice; Chapter 5 discusses self-experiments in Japanese. Chapters 6 and 7 go over non-self-experiments in Japanese and English, respectively. Finally, Chapter 8 is intended to be a preliminary form of a manual for non-self-experiments in LFS.

Part 3, "LFS as an Exact Science", situates LFS in a broader context. Chapter 9 does so by comparing LFS with physics, addressing how categorical predictions and their experimental testing are possible in LFS, despite the fact that measurement in LFS is qualitative rather than quantitative. Chapter 10 concludes the volume by summarizing the preceding chapters; it addresses how compatibility-seeking approaches can fail to make definite predictions and how the correlational methodology in LFS makes it possible to do so.

I would now like to briefly talk about the evolution of the project of this volume. I was acquainted with Hajime's research since the early 1990s when he was struggling with ideas that eventually coalesced into LFS; I have witnessed his pursuit of LFS as an exact science and his enthusiasm and effort over the years, and I have also done joint research with him, including some published works. During a meeting in my office in December of 2019, he explained the correlational methodology, writing down its core idea on the whiteboard; that idea came to be the basis of this volume. I was convinced then, based on my own self-experiments, that it is possible to obtain categorical judgments by using correlation. I in fact came to understand that this method was an explicit statement of the method he had been using since the 1990s as understood in the terms of the current approach. Since that point on, I had been hoping that his theory and concrete method of experiments for testing hypotheses be put in one place in some way and be published in the form of a book. Fortunately, Ayumi Ueyama, Emi Mukai, and Daniel Plesniak, (the latter of

whom subsequently became one of the editors), have agreed to contribute chapters to this volume; they have written dissertations under Hajime's supervision, having made their own contributions at different stages of LFS's development. The book proposal was then approved as a volume in Mouton-NINJAL Library of Linguistics series by NINJAL and De Gruyter Mouton.

Every chapter of the volume underwent internal review by contributors to the volume, and the three editors commented on every chapter regarding its content and style, and the submitted version thus created was reviewed by an external reviewer. The chapters were revised based on the external review, resulting in the final versions.

I would like to thank the external reviewer for taking on the difficult task of reviewing an earlier draft of the volume, and Haruo Kubozono of NINJAL, co-editor of the series, Michaela Göbels, Birgit Sievert, and Kirstin Boergen of De Gruyter Mouton, for their generous help at various stages of the production of the volume.

The editors and the authors would like to thank Kiyoko Kataoka, Teruhiko Fukaya, Audrey Bongalon, Junichi Iida, Asako Miyachi, Felix Qin, Carolin Scherzer, Shun Shiranita, and Yoona Yee for their contributions at various stages in the development of LFS and to the completion of this volume. We would also like to thank Yasuo Deguchi for giving us insightful comments regarding how LFS as an exact science may be placed in the context of the philosophy of science, and Jiro Gyoba for his suggestion that has led to the visual presentation in this volume of core ideas of LFS, including the Venn-diagram-based presentation of experimental results. Special thanks are due additionally to Emi Mukai, who did extra work in checking references and consistencies in formatting.

This volume is the first book that presents a concrete illustration of how research that deals with a mental phenomenon, such as the computational system that is responsible for mapping between linguistic forms and meaning, can be pursued as an exact science. I hope many young researchers in the coming generations will join this enterprise.

Yukinori Takubo,
April 2022

References

Chomsky, Noam. 1975. *Logical structure of linguistic theory*. New York: Springer.
Chomsky, Noam. 1995. Language and nature. *Mind* 104(413). 1–61.
Ueyama, Ayumi. 1998. *Two types of dependency*. Los Angeles, CA: University of Southern California dissertation.