CONCEPTUAL AND METHODOLOGICAL BASES
OF THE MINIMALIST PROGRAM

KAZUKO INOUE
Kanda University of International Studies*


Keywords: discrete infinity, linguistics as a natural science, unification of research on language and the brain, perfection, interface conditions

0. Introduction

The book under review is unique among the already published books of this kind in making special editorial efforts to promote deeper understanding of the conceptual and methodological bases of the Minimalist Program, a natural outcome of the development of linguistics as one branch of the natural sciences, and to further explore the possibility of unifying linguistics with the physical sciences. This book contains the transcripts of three lectures by Noam Chomsky given in the fall of 1999, when he was in Pisa and Siena on the occasion of the twentieth anniversary of the Pisa seminars (1979), whose contents were published as the monumental work, Lectures on Government and Binding (1981). The first lecture, Chapter 2 of this book, was delivered on October 27, 1999, on the occasion of Chomsky’s having received an honorary degree from the Scuola Normale Superiore in commemoration of the

* I am deeply indebted to the anonymous EL reviewers for their invaluable comments on the earlier version of this review article, which led to some refinements and reorganization of the paper. My special thanks go to A. R. Black, R. Martin, Y. Ueda, and in particular to K. Fujimaki for their comments and/or help in editing. The remaining inadequacies are of course mine.

© 2004 by the English Linguistic Society of Japan
anniversary. The second lecture in Chapter 3 was given as a public lecture at the University of Siena on November 16, 1999, followed by the lecture in Chapter 5 on November 18, 1999. Chapter 5 is one of quite a few publications by Chomsky as a social scientist and intellectual activist. Due to limitations of space this lecture is not reviewed herein.

With the first two lectures as its core, the book is organized as follows:

Chapter 1: Editors' introduction: some concepts and issues in linguistic theory
Chapter 2: Perspectives on language and mind
Chapter 3: Language and the brain
Chapter 4: An interview on minimalism
Chapter 5: The secular priesthood and the perils of democracy

Given the perspectives on language and mind in Chapter 2 and the prospect of unifying research on language and the brain in Chapter 3, the question arises as to how these two viewpoints fit into the Minimalist theoretical framework. Chapter 4 deals with this problem in the form of an interview conducted by the editors with Chomsky. Questions (17 in total) are raised to clarify or extend the arguments given in Chapters 2 and 3. In order to facilitate understanding of the contents of the linguistics part of the book, some background of modern theoretical linguistics is provided in Chapter 1.

The editors state in the preface, "The common denominator uniting the first four chapters of this book is the idea of studying language as a natural object, a cognitive capacity that is part of the biological endowment of our species, physically represented in the human brain and accessible to study within the guidelines of the natural science" (p. ix). The aim of this review is to show that the Minimalist Program (MP) is a natural outcome of Chomsky's theoretical pursuit for studying language as a natural object, on the conceptual and methodological bases underlying generative grammar since its inception in the 1950s, and to suggest a future research direction in view of the current status of the MP and its objective.

In his two lectures, Chomsky critically reviews the development of generative grammar as the basis of the MP, pointing out first the achievement of the formal description of language in the 60s, followed by the success of the formal and substantive characterization of Universal Grammar (UG) in the framework of the Principles and
Parameters (P & P) approach, and finally the status of the MP as a theoretical basis for testing the theory of UG in terms of the optimality of the system.

In order to provide a coherent picture of the content of the linguistics sections of the book, this review is structured as follows:

1. The Conceptual Basis of Generative Grammar
   1.1. Awareness of the Unique Properties of Language
   1.2. The Need for Studying Language as a Natural Object

2. The Methodological Basis of Generative Grammar

3. Developments in Chemistry and Biology
   3.1. Along the Lines of the Newtonian Research Attitude
   3.2. The Achievements of D’Arcy Thompson and Alan Turing

4. The Principles and Parameters Approach
   4.1. Descriptive and Explanatory Adequacy
   4.2. Contributions of the P & P Approach

5. New Concepts and Issues of the Minimalist Program
   5.1. The Motivations for the Minimalist Program
   5.2. The Substantive Thesis of the Minimalist Program
   5.3. “Perfection in Language”

6. Unification of Research on Language and the Brain
   6.1. Minds as Emergent Properties of Brains
   6.2. Methodological Thesis
   6.3. The Modular View of Language Learning

7. Questions Specifically Addressed to the Minimalist Program

8. Conclusion

The above list is based on the reorganization of the main topics, which are spread over Chapters 2 and 3, and many of which are elaborated and expanded upon in the discussions given in Chapter 4. Necessary annotations and comments are provided in the course of discussion.

Before jumping into the main topics of this review, let me briefly mention a few points concerning the editors’ introduction in Chapter 1. This chapter serves as a good introduction to the development of generative grammar and its basic concepts and issues.

Some passages in Ferdinand de Saussure’s *Cours* are cited to show his awareness of the freedom of combinations of elements constituting a phrase and their regularities. It strikes me as curious that only Saussure’s work is referred to in relation to this point, given the fact that his followers in Europe and researchers working in the tradition of American structural linguistics also made great achievements in objec-
tively uncovering the regularity of syntactic patterns. All of them shared Saussure’s point of view that language is a social object, in contrast to the ideas of philosophers of the first cognitive revolution as well as the views of Chomsky.

The following is the editors’ sketch describing the evolution of the technical characterization of the recursive property of syntax over the past fifty years (p. 4): (a) generalized transformations in the earliest model (Chomsky (1957)); (b) recursive phrase structures (Katz and Postal (1964), Chomsky (1965));¹ (c) a recursive X-bar theory (Chomsky (1970), Jackendoff (1977)); (d) the basic syntactic operation “merge” in the MP, recursively combining two elements forming the third which is the projection of one of its constituents (Chomsky (1995)).

It seems to me that a crucial point has been left out of this review of the technical evolution of generative grammar. Chomsky claimed that the early phrase structure rules were inadequate as a sole device for capturing the regularity of syntactic structures, which are related to each other in systematic ways yielding repertoires of syntactic structures that are freely chosen to meet contextual requirements. This is why singular as well as generalized transformations were claimed to be indispensable in the earliest model of generative grammar.

1. The Conceptual Basis of Generative Grammar

This topic is one taken up repeatedly by Chomsky in his lectures and writings, hence there may not be any need for repeating it here. Nevertheless, I will include this topic, as it is an indispensable starting point to any discussion of the MP and its place in the development of generative grammar.

1.1. Awareness of the Unique Properties of Language

The awareness of the unique properties of language, that is, the use of a finite number of means to express an unlimited number of

¹ A phrase structure with a subordinate sentence embedded in an appropriate position in the matrix sentence permits recursion of phrase structure rules. This device generates sentential subject and complement structures.
thoughts, is the key to the conceptual revolution in linguistics. Chomsky emphasizes the fact that among the philosophers of the seventeenth to early nineteenth century there was a trend that deserves to be called the first cognitive revolution. According to him, the main figures who brought about the first cognitive revolution were: (1) Galileo, who was the first to express the realization that the twenty-four characters of alphabetic writing serve as a means for unbounded expression of one’s thoughts, (2) the philosopher-grammarians Descartes and his followers (the Port Royal Grammarians), who elaborated on Galileo’s idea by emphasizing the fact that a very limited number of sounds are used to construct an infinite number of expressions, which do not bear any resemblance to the thoughts they represent, and insisted that this property of language (creativity exercised by free will) should be the central topic of the study of language, and (3) Charles Darwin, who noting the creative property of language about two centuries later was particularly concerned about its implications for the biological isolation of humans in view of his general theory of the evolution of organisms. Even though these philosophers shared an awareness of the unique properties of human language, they were without any means to formally characterize it.

The second cognitive revolution was brought about by Chomsky in the middle of the twentieth century, with the same conceptual basis as that of the first cognitive revolutionists but using the means to formalize the faculty of language (FL, implicit knowledge of language), capable of producing remarkable syntactic regularity and unbounded use of a finite number of means, that is, “discrete infinity” in technical terms. He demonstrated how to characterize this property in a grammatical model employing the recursive function theory developed in mathematics. He continued to make efforts to formally characterize the unique properties of language, with discrete infinity as the core, in his pursuit of studying language as a natural object with methods employed by some branches of natural science, which gave theoretical linguistics “deductive depth of the models and experimental controls of their validity” (p. 4).

2 This is “the arbitrariness of sound-meaning correspondences” in the Saussurean terms.
1.2. The Need for Studying Language as a Natural Object

Since there has been strong opposition to the view of studying language as a natural object (e.g. Chomsky (2000: Chapter 2)), some arguments supporting this view are given here, even though they do not appear as coherent arguments in the text. There appears to be no other system in the animal world comparable to the human faculty of language with this property of discrete infinity. Variation among languages with respect to FL is almost non-existent. In other words, great uniformity has been noted, despite the many superficial variations among languages. Since there is no significant analogue elsewhere, it is reasonable to conclude that FL is a species-specific property.

As generative studies progressed, it was revealed that a speaker’s knowledge of language, which underlies the creative aspect of language use, is extremely complex and rich, and that every speaker knows implicitly a system of formal procedures for organizing expressions into meaningful units. Moreover, it was found that a speaker knows abstract structural relations, which do not appear in actual utterances. For example, knowledge of the relation c-command is crucial in determining when the coreferential interpretation of a pronoun and a name is possible. However, it is not conceivable that a structural relation like the c-command is taught to children, since adults are not even aware of such an abstract relation.

Furthermore, every child in every linguistic community uniformly acquires a language with a very rich, complex, and abstract system within a fairly short period of time. Even (large-scale) sensory deficit seems to have limited effect on language acquisition (Chomsky (2000: 121)). A reasonable assumption in the face of these facts is that children are born with FL, which enables them to develop the rich system of FL on the basis of very limited linguistic experiences. Based on facts such as these, generative grammar regards FL as a species-specific biological endowment.

The above assumption naturally leads us to the claim that FL is part of the cognitive system in the brain and it must be studied as a physi-

---

3 A c-commands B in the structural configurations of (i) and (ii), where A is an immediate constituent of $\alpha$.

(i) \[ [\alpha \ldots A \ldots B \ldots] \]

(ii) \[ [\alpha \ldots B \ldots A \ldots] \]
Strong opposition to this view is often based on the misconception that it applies to all aspects of language. It is FL that is claimed to be the object of generative study as part of the natural sciences.

2. The Methodological Basis of Generative Grammar

In answer to the questions raised by the editors concerning the methodological assumptions of the MP (pp. 98–102), Chomsky refers to the expression “Galilean style” used by Steven Weinberg, a nuclear physicist. He sums up Weinberg’s viewpoint of the “Galilean style” as “the recognition that it is the abstract systems that you are constructing that are really the truth; the array of phenomena is some distortion of the truth because of too many factors, all sorts of things” (p. 99). Chomsky states that this style involves two parts, one being a change in viewpoints from the focus on data to theory construction for the sake of explaining phenomena, and the other being the question of constructing the best intelligible theories, that is, theories that lead to true understanding of the phenomena of experience. The first was the outcome of Galileo’s attempt to account for natural phenomena, including language, in the framework of the mechanical philosophy, then a very popular concept, which viewed the natural world as “a complex machine that could in principle be constructed by a skilled artisan” (p. 49). In the course of this attempt, Galileo realized that it was impossible to give mechanical explanation to natural phenomena, and gave up his attempt to understand everything in nature, stating that natural phenomena are beyond human understanding. Putting aside the inquiry into the cause of natural phenomena, Galileo selected only the data relevant to the explanation of natural phenomena, discarding all else.

This attitude, advocated by Chomsky, is in a sharp contrast to the claim made by American structural linguists that everything in the corpus is valuable for a complete description of a language. For them the key words in linguistic analysis are the three Es: elegance, exhaustiveness, and economy. Still, the very decisive attitude of throwing out most of the data is perhaps best rephrased as “putting aside most of the phenomena for the time being or forever,” because some of the phenomena might turn out to be relevant when a new perspective or new line of theorization emerges.

Galileo’s attitude took a definite shape through Newton’s rejection of
the mechanical philosophy altogether, and his emphasis on deriving a few general principles from natural phenomena, and showing how the phenomena follow from those principles. Thus, the second aspect of the “Galilean style” is due to Newton’s decision to adopt “a new and weaker model of intelligibility” (p. 53), constructing the best theories that could account for natural phenomena.

3. The Developments in Chemistry and Biology

Since Chomsky claims that the study of FL is a branch of natural science, it is desirable to present a parallel found in another natural science. Moreover, the problems currently faced by the modern cognitive sciences, including linguistics as a core discipline, are very similar to those chemistry faced from the time of the collapse of the mechanical model up to the time of its unification with physics. Biology offers good examples of scientific pursuits analogous to the Minimalist attempt in linguistics. These are the reasons why Chomsky gives a detailed review of the developments in chemistry and biology.

3.1. Along the Lines of the Newtonian Research Attitude

A body of doctrine Newton established under his guiding principles concerning the laws of gravitation motivated a similar approach in chemistry. This approach was strongly recommended by the eighteenth-century English chemist Joseph Black, who encouraged his colleagues to establish a rich body of doctrine, putting off the attempt to explain “the laws of chemical affinity” governing chemical reactions. Proceeding along this line, independent of the newly developing physics, chemistry established a rich body of doctrine, paving the way to the dramatic unification with, but not reduction to, the radically revised physics in the 1930s.

According to Chomsky we can learn a good deal by reviewing the changes chemistry underwent before the unification. In the face of strong doubts concerning the reality of chemistry, to take an example, the idea of molecules and chemical properties as calculating devices, which had been entertained by prominent scientists up to the early part of the twentieth century, chemistry accumulated an enormous body of doctrine before unification. The present situation in linguistics seems to parallel the status of chemistry at that time.

Chomsky adds that following this unification, biology was reduced to
physical chemistry, resulting in the new discipline called biochemistry. According to him this is a genuine example of reduction in the sciences (p. 71). However, a more accurate account must be given to this phase in the development of chemistry.

It is true that chemistry is in some aspects an indistinguishable part of physics now, but its practical area has further developed into material science. The rest of the field of chemistry was unified with biology into the discipline of biochemistry, which is now a part of molecular biology, constituting the basis of life science. It seems to me that both chemistry and biology underwent radical changes leading to that unification, in which case it would not be adequate to talk about a simple reduction of biology to chemistry. As the result of all these changes, we now no longer find traditional chemistry actively pursued in advanced research. This fact probably prompted Chomsky to remark that “for theoretical chemists there is now understanding that there’s a quantum-theoretic interpretation of what they are doing, but if you look at the texts, even advanced texts, they use inconsistent models for different purposes ...” (p. 102).

3.2. The Achievements of D’Arcy Thompson and Alan Turing

It is true that even detailed descriptions provide only a list of problems to solve without giving any clues for explanation. However, it is very difficult to go beyond description, trying to answer the minimalist question of “why some specific property exists in a system” or “whether there is a natural law governing the emergence of a certain property.”

In the field of biology, D’Arcy Thompson and Alan Turing produced pioneering work which aimed to answer the above questions. The following paragraph gives an outline of Chomsky’s explanation supplemented by my annotation:

D’Arcy Thompson tried to show that most aspects of the nature of organisms can be accounted for by finding out what possible forms they can take and formulating a general law governing their emergence. His solution was a mathematical formula to account for the spiral growth of shells (and fingernails), in which the shape is preserved because all components grow at the same rate (Scott F. Gilbert (2000: 18–20). A similar approach was taken by Alan Turing, a famous mathematician and computer scientist. He proposed the mathematical model,
the reaction-diffusion model, in which two substances are involved; one of them, substance S, inhibits the production of the other, substance P, which promotes the production of more substance P as well as more substance S. If S diffuses more readily than P, sharp waves of concentration differences will be generated for substance P, yielding specific patterning. Turing's mathematical model has been used to model the spiral patterning of slime molds, the pigment patterns of mammals, fish, snails, and so on. (ibid.: 20-22)

The work of these researchers brought new prospect of development to biology. They support the direction that generative grammar has taken after establishing a rich body of doctrine. If the MP succeeds in discovering natural laws, which account for the specific properties of language, generative grammar will meet the expectation as a branch of natural science.

4. The Principles and Parameters Approach

4.1. Descriptive and Explanatory Adequacy

Language acquisition is regarded as a transition from an initial cognitive state to a stable state, with a number of intermediate states. The Universal Grammar (UG) is the theory of the initial state (the state of mind at birth). A particular grammar is the formal theory of the stable state (the native knowledge of a natural language).

The distinction between descriptive adequacy and explanatory adequacy of a grammar as a theory of language was introduced in Chomsky (1965). The former is the level of adequacy a grammar attains to the extent that it correctly describes the native speaker's knowledge of his language, while the latter is the level a linguistic theory attains to the extent that the theory can select a descriptively adequate grammar on the basis of primary linguistic data, the linguistic data the child is confronted with after birth. (Chomsky (1965: 24–25)) This distinction remained an important one within the P & P approach, which aimed at accounting for the superficial diversity of language as well as the uniformity of language acquisition.

4.2. Contributions of the P & P Approach

It became evident at the beginning of the 1960s that there was a serious tension between the two types of adequacy. The pursuit of the for-
mer led to very complicated accounts for individual language phenomena as well as individual constructions, whereas the latter required a very restricted system, uniform across languages, in order to account for the fact of language acquisition. In the 1960s and throughout the 1970s many conditions on rules were discovered and great efforts were made to reduce the variety of phrase structures and transformational grammars, resulting, for example, in the X-bar theory and the elimination of language/construction specific transformational rules in favor of the universal operation Move Alpha, or "Move anything anywhere." Many efforts were made to show that the apparent diversity was merely superficial and that general principles, regarded as the genetic endowment of the child, governed the rules, from which they were abstracted. And there emerged awareness that some UG principles have parameters associated with them, which are responsible for syntactic variation. According to Chomsky, at the Pisa seminars all of these efforts converged into a methodological proposal for the complete elimination of rules and constructions. In this way the P & P approach made a great contribution to linguistics by giving a genuine framework for theory.

These changes in perspective with regard to grammar came to have a significant bearing on the problem of language acquisition. The child, endowed with UG, is assumed to be born with knowledge of the universal principles underlying syntactic operations, whereas exposure to primary linguistic data is believed to be responsible for the setting of parameters. This encouraged more and more theory-conscious studies of language development, one of the initiators of this line of inquiry being Hyams (1986).

It should be noted in this connection that very productive psycholinguistic research initiated by Hyams' work on the use of null subjects by English children has brought support to the hypothesis that some parameter setting takes place very early but actual acquisition is delayed due to factors involved in "maturation." For example, Sano's (1998) experiments concerning negation errors in the child's use of Japanese demonstrate that the acquisition of the Japanese infinitival affix -a (mizenkei—irrealis morpheme), as well as English inflected verb forms as opposed to the child's use of bare infinitives, requires knowledge of Adjunction-Affixation, the acquisition of which is "delayed" due to morphological maturation. Fujino and Sano (2000) show that in the

---

4 English past tense -ed and agreement -s are affixes adjoined to verbal roots.
case of Spanish children, the parameter-setting takes place very early for [-Null Object], but their use of null objects continues until they can be replaced by the use of clitics. They claim that the acquisition of clitics is delayed due to problems concerning Spell-Out (producing phonological forms of clitics). The findings of quite a few researchers along this line have led to changes in the concept of LAD (Language Acquisition Device).

5. New Concepts and Issues of the Minimalist Program

Underlying all of the innovating concepts of the MP, there exists a basic question as to whether the system of language is optimally designed. Four questions posed by the interviewers clarify this point.

5.1. The Motivation for the Minimalist Program

*Question:* What stimulated the emergence of the minimalist intuition? Was it related to the systematic success of the research strategy of eliminating redundancies? (p. 95)

*Answer:* The P & P approach is the result of a pursuit of the reduction of complexity. One aspect of the motivation for the MP is methodological necessity, but it is rooted in the following question raised in the early 1980s: “Is it possible that the system of language itself has a kind of optimal design, so is language perfect?” (p. 96)

Japanese Irrealis (mizen-kei) affix -a is also adjoined to verbal roots. This is called Adjunction-Affixation by Sano (1998), which is not completely operative at first and matures at a certain point. The English child uses bare infinitives in place of inflected verb forms until affixation of inflectional affixes is learned. In the same way, the Japanese child cannot use the Irrealis affix attached to a verb in front of the negative morpheme nai until he learns the adjunction of -a. For example, *aruk-u-nai* (walk-Present-Neg, “do not walk”) is used in place of *aruk-a-nai* (walk-Irrealis-Neg).

*As the anonymous reviewer pointed out, the goal of generative grammar has been the satisfaction of these methodological necessities, guided by Galileo’s view of nature, “we have been guided ... by our insight into the character and properties of nature’s other works, in which nature generally employs only the least elaborate, the simplest and easiest of means” (p. 57). Here it is stressed that there is another deep-rooted motivation for the MP.*
5.2. The Substantive Thesis of the Minimalist Program

**Question:** "What is the substantive thesis of the MP?" (p. 98)

The following answer came out in exactly the form of a question raised in natural science.

**Answer:** Distinct from the methodological assumptions, the substantive thesis tries to answer the question of how well the object of study is designed. To answer this question, one must ask, "How well designed is the object for X. And the best possible answer is: to let 'X' be the elementary contingencies of the physical world and let 'best design' be just an automatic consequence of physical law, given the elementary contingencies of the physical world" (p. 104).

Cast in the framework of linguistics, "the elementary contingencies of the physical world" are the interface conditions imposed by the systems of the mind and brain, that is, the sensorimotor and thought systems. And this question can be rephrased as: "Could it be that FL is an optimal solution to interface conditions imposed by the systems ... in which it is embedded?" (p. 90).

5.3. "Perfection in Language"

Given the basic minimalist question of the perfection in language, that is, the question of whether FL could be an optimal solution to interface conditions, the phenomenon called dislocation, commonly found across a variety of languages, seems to induce the negative answer to this question. In clarification of this point, the following two questions were raised:

**Question 1:** What kind of criteria of perfection make the minimalist thesis sustainable? (p. 105)

**Answer to Q1:** Optimality intended by the MP is totally different from the common interpretations, one implying reduction of complexity, and the other based on functional points of view. The minimalist criteria of perfection depend on the question, "Is it well designed with regard to the internal systems (sensorimotor and thought systems), with which it must interact?" (p. 108)

**Question 2:** How can the two aspects of morphology, imperfection and the defining property of natural languages, be reconciled within the minimalist perspective? (p. 109)

The answer to this question turns out to be a good illustration of the
research direction of the MP, namely “to try to show that the apparent imperfections in fact have some computational function, some optimal computational function” (p. 118).

**Answer to Q2:** First, plurality, case, and agreement are taken up as illustrative examples. Plurality on nouns is not an imperfection, since it is necessary for the external systems to know the distinction between singular and plural nouns, but plurality on verbs is an imperfection, because this feature on verbs is redundant and not interpreted. Agreement features on verbs are uninterpretable in this sense and as such reveal an imperfection from the Minimalist point of view.

Chomsky states (p. 113) that the split between the structural and inherent case was not noticed until the emergence of the P & P approach. However, Kuroda (1965) made the distinction in his grammar of Japanese, generating noun phrases in the structural case positions without any case-marking, which were to be assigned structural case particles in the course of derivation, as opposed to inherent case particles, which were introduced in the deep structure with their complement noun phrases. This distinction has since been maintained in all the generative Japanese grammars, which contributed to the formalization of the Japanese case system. It is curious that such important results of Japanese generative research had gone without drawing the attention of specialists until the early part of the 1980s.

In Minimalist terms, inherent cases are not an imperfection, since they mark semantic relations needed for interpretation, whereas structural cases like Nominative and Accusative do not yield any semantic information. Therefore, the question is: why do structural cases exist? A possible answer is that they may be there as “an optimal method of implementing something else that must be there, namely dislocation” (p. 113).  

However, the above comment applies to languages in which structural cases are determined by structural positions. The situation is very different in languages with both structural and inherent cases marked by particles. In Japanese, where agreement in the above sense is absent,

---

6 This is not a definitive argument, as Chomsky admits, “I don’t think this is a knock-down argument. It’s a plausibility argument” (p. 116).
even the so-called structural case particles carry some semantic content and are interpretable. It may not be inappropriate to say that Japanese noun phrases are licensed in situ by particles.

Chomsky continues that there are two types of semantic properties: the first involves LF, yielding interpretations based on the so-called Thematic Relations such as Patient, Experiencer, Source and so on, and the second is related to the position a dislocated element occupies, that is, the second is “surface-related” and provides discourse-oriented information like new and old information. The surface-related properties involve the edge position of a clause, inducing displacement such as the movement of a focus phrase to the edge of a sentence. The LF-related semantic properties do not involve displacement but instead require a local relation between elements that assign semantic properties (theta-roles) and those that receive them. Then the thought system is regarded to look for edge-related and locally related information. It is concluded, “well-designed languages are going to have a dislocation property” (p. 114).

However, a deeper question is why a focused element must eventually occupy a position in the left periphery.

To implement the dislocation property, three kinds of uninterpretable features, that is, agreement features on verbs, structural case features on nouns, and the EPP feature, are needed. And in order for expressions to be interpretable at the interface, uninterpretable features must be eliminated. It is assumed that once they have performed their function, they are eliminated. Thus, these uninterpretable features need not be taken to be imperfections.

The phonological system seems to be an enormous imperfection. Since only unpredictable phonetic forms are included in lexical representation, probably none of the phonological elements in lexical representations are interpretable by the sensorimotor system. Now the ques-

---

7 Projection Principle: Representations at each syntactic level (i.e., LF, and D-and S-structure) are projected from the lexicon, in that they observe the subcategorization properties of lexical items. (Chomsky (1981: 29)). The Projection Principle, together with the requirement that every clause must have a subject, constitutes the Extended Projection Principle. Now the EPP feature used in the MP not only stands for the latter part of this principle but also secures the position for a dislocated element.
tion is whether phonology is an imperfection or an optimal solution to some problem. The best answer to the above question would be that the superficial imperfection of phonology is an optimal way of doing the job of relating syntactic objects to the sensorimotor system with its own properties. An answer to such a question in concrete terms is not easy to come by, but it is nevertheless a meaningful question. Chomsky stresses that such a question did not even arise until it became possible to think of it in these terms.

6. Unification of Research on Language and the Brain

The main theme of this section is the possibility of unifying research on language and the higher mental faculties with biology. It is true that the search for historical contingencies and physical laws is essential for the solution to the problem of the "perfection of language" as well as for an attempt at unifying research on language and the brain. However, from the point of view of methodology, this search is not at all feasible at present, since, as the cognitive scientist Fodor admits, "we are currently lacking some fundamental ideas about cognition" (Fodor (2000: 99)).

There are two groups of people in Chomsky's opinion, one maintaining that language and higher mental faculties do not belong to biology, and the other assuming that they belong to biology in principle. For the former group, the unification of these two is not an issue at all. The latter group is further divided into two with the following views.

(A) Unification is close at hand.

(B) We do not currently see how these parts of biology relate to one another, and suspect that fundamental insights may be missing altogether. (p. 62)

Chomsky takes position (B) and states his reasons for this position, selecting the following three theses as frameworks for discussion.

(1) the thesis by neuroscientist Vernon Mountcastle: "Things mental, indeed minds, are emergent properties of brains."

(2) the thesis by ethologist Mark Hauser: four perspectives (proposed by Tinbergen) to be adopted in studying animal communication:
   (i) Seek the mechanisms that implement it, psychological and physiological; the mechanistic perspective
   (ii) Sort out genetic and environmental factors, which can
also be approached at psychological or physiological levels; the ontogenetic perspective

(iii) Find the “fitness consequences” of the trait, its effects on survival and reproduction; the functional perspective

(iv) Unravel “the evolutionary history of the species so that the structure of the trait can be evaluated in light of ancestral features”; the phylogenetic perspective

(3) the thesis by cognitive neuroscientist C. R. Gallistel: the “modular view of learning” (pp. 63–64)

6.1. Minds as Emergent Properties of Brains

According to Chomsky this thesis has been proposed by eminent scholars throughout the past three centuries; for example, in the eighteenth century by Joseph Priestly, a century later by Darwin, and today by Vernon Mountcastle (p. 70). However, still without any satisfactory understanding of the human mind and brain at present, the integration of mental aspects of the world with others appears to be a distant goal.

6.2. The Methodological Thesis

By critically reviewing Mark Hauser’s Evolution of Communication, Chomsky shows how irrelevant a comparative study of communication is to the study of (human) language.

Concerning Hauser’s perspectives (i) and (ii), questions are left unsolved about physiology and evolution of even a very simple system such as the “dance language” of honeybees, which is sometimes regarded as similar to human language with respect to an infinite number of combinations, and the ability to refer to something outside of the scope of perception. In view of this fact, a proper study of language, a much more complex system, in terms of these perspectives is a remote goal.

Borrowing ideas from the neuroscientist Terrence Deacon, Hauser speculates that “the human brain, vocal tract, and language appear to have co-evolved,” motivated by the need for communication. The conclusion of these researchers, according to Chomsky, seems to be that “it is an error to investigate the brain to discover the nature of human language; rather, studies of language must be about the extra-biological entities that co-evolved with humans and somehow ‘latch on’ to them” (p. 83). In this view of co-evolution, it is assumed that the child has no more than a “general learning theory.” This conclusion can be sustained only through drastic changes in perspective, as shown by the
cognitive neuroscientist Gallistel.

The third perspective, the functional one, can be maintained by investigating the use of individual languages without restricting one’s attention to the effects on survival and reproduction, contrary to Hauser’s approach. The phylogenetic perspective is a goal unattainable by the present state of sciences, which, to say the least, does not seem to be promoted by the comparative study of communication.

It is now clear that Hauser fails to demonstrate the validity of his proposal of methodological procedures. It may strike one as rather curious for Chomsky to dwell on Hauser’s ideas at all. Hauser does not even include language in his typological list of systems of communication. One reason for Chomsky’s insistence may be that the type of misunderstanding Hauser reveals in his discussion is so common and deep-rooted among people in general. Concerning Deacon’s “co-evolution,” Chomsky states that the idea of language as “an extra-human object” is the standard view of philosophers of mind and language (p. 62). It is true that there are many who study language holding similar ideas unconsciously. It should be noted that this is an interpretation inevitably assigned to the position of the people who do not accept the assumption of the existence of FL itself and its status as part of the natural organ, the brain. Another reason for Chomsky’s insistence is that Hauser’s four perspectives are quite reasonable and may turn out to play an important role in studying the fundamental properties of language, though it may take place in the remote future.

6.3. The Modular view of Language Learning

Chomsky regards Gallistel’s modular view of language-learning to be quite adequate. Elaborating on Tinbergen’s idea of the “innate disposition to learn,” Gallistel claims that learning is based on “specialized mechanisms, or ‘instincts to learn’ in specific ways.” According to Gallistel, these mechanisms can be taken to be “organs within the brain” (such as a language module), “whose structure enables humans to perform one particular kind of computation” (p. 84). In this sense, human language acquisition is instinctively carried out, induced by the very nature of a specialized “language organ.” This is the standard idea widely accepted in neuroscience.

Chomsky gives a few comments concerning language acquisition and LAD: Language acquisition proceeds as “the initial state changes under the triggering and shaping effect of experience, and internally deter-
mined processes of maturation, yielding later states that seem to stabilize at several stages, finally at about puberty” (p. 85). LAD is a device that maps experience into state L. Chomsky adds in this connection that substantive discussion on language acquisition, including the acquisition of lexical items, led to the postulation of a language organ that is universally richer and more specific to language than those ever before postulated. Even the simplest of lexical items turns out to have rich and complex semantic and/or formal structures. As research on language acquisition progressed, it became reasonable to assume that the essentials of all of this semantic as well as structural information are part of the innate biological endowment.

As is stated in Section 4.2, Chomsky’s present view of language acquisition is different from the view entertained before the introduction of the P & P approach, which gave little attention to the question of the process of language acquisition. The MP further claims that there is no distinction between the levels of descriptive and explanatory adequacy and what matters is the descriptive adequacy of all the states involved in language acquisition. On top of this, the structural and semantic features of core lexical items are assumed to be part of the innate biological endowment. This assumption invites a serious study of the content and internal structure of lexical items. To validate this assumption large-scale research projects are essential, covering morphological and lexical diversity as well as their basic uniformity. It seems that some basic (and possibly rather simple) organizational principles, yet to be discovered, are at work behind lexical complexity.

Since research on the components of the mind-brain has made dramatic progress, it may be justifiable to entertain expectations for a new technology to successfully explore mental aspects of the world and the emergence of the mind-brain. However, we are still in a state of ignorance concerning the relations between language as well as the higher mental faculties and their biological bases, and there may be fundamental insights missing. This is the reason for Chomsky’s pessimism concerning the prospect of unifying research on the mind and body in the near future.

7. Questions Specifically Addressed to the Minimalist Program

Given the new concepts of the MP in Section 5, this section deals with the remaining questions, divided into three groups by the reviewer:
the first concerning empirical justification for the MP, the second concerning the significance of the study of the left periphery in relation to interface conditions, and the third asking for further illustrations of "Minimalist" approaches in some branches of the natural sciences.

7.1. Question Group 1:

**Question 1:** What kind of empirical discovery would lead to the rejection of the strong minimalist thesis? (p. 124)

**Answer to Q1:** All the phenomena of language apparently refute the strong MP, but the crucial question is whether there is "some other way of looking at the apparently refuting phenomena, so as to preserve or preferably enhance explanatory power" (p. 124).

**Question 2:** What are the aspects that Chomsky would consider "established results" in linguistics? (p. 151)

**Answer to Q2:** Everything is subject to question from the viewpoint of the minimalist. In any "live" discipline no doctrine is expected to be stable, because new perspectives will always force reinterpretation of old doctrines. The same holds with generative grammar.

**Question 3:** The Minimalist Program selects its own empirical domain on the basis of its stringent criteria, thus leaving out of its scope a significant part of the previously constituted "body of doctrine." Is this inevitable? Do you think it is desirable? (p. 155)

**Answer to Q3:** It is impossible to subject everything to a minimalist question. But asking why morphology is in language led us to the discovery of something quite new; that is, the difference between interpretable and uninterpretable features. The same question will be addressed to ECP, binding, government, and so on. Answering this question is neither easy nor an automatic consequence of the fact that the language has to be interpreted at the interface. However, it is still premature to give up the effort for explanation, leaving it as a mystery (p. 157).

7.2. Question Group 2:

**Question 1:** How can the so-called cartographic studies relate to the topics and goals pursued by the Minimalist Program? (pp. 122-123)
**Answer to Q1:** As a first approximation, the following seems to be the general form of the clause: \[...C...[...T...[...V...]]\]
Cartographic researchers made it clear that the parts indicated by ... have rich structures. The results of this kind of work will lead one to inquire more closely on much firmer grounds than before into the nature of interface relations, the "external" systems, and conditions they impose on a well-designed language faculty.

We can agree with Chomsky that the cartographic studies have made a valuable contribution to the study of so far neglected areas of generative grammar. These studies integrate tense, mood, aspect, and voice into a rich system with corresponding adverbs holding the Specifier-Head relation with them. Making extensive typological investigations, these studies clarified phenomena in the left peripheries, which are closely related to the interface with the thought system. However, some of the research results seem to be a kind of first approximation. For example, the same adverb appearing in two different positions with distinct meanings is said to be associated with two different functional categories. Some refinement and the discovery of basic unifying principles are called for. Of course proliferation of functional categories must be checked against the Minimalist criteria.

**Question 2:** The MP relies heavily on a theory of the interfaces, which should provide the external constraints to be met by the language faculty. However, the program does not offer much guidance for the study of systems that are assumed to be language-related, but differently constituted from "narrow syntax." Do you think this is a contingency of the current state of research, and things could, or should, change in the future? (p. 157)

**Answer to Q2:** As for the nature of interfaces, there has been no answer given so far. However, some recent studies suggest that there might be different interfaces for articulation and perception, contrary to the general assumptions of the existence of two interfaces, sound and meaning.

On the side of meaning, some of the important research results do not seem to satisfy the minimalist conditions on FL. Binding theory, quantifier scope, and the operations that seem to involve movement like Antecedent Contained Deletion are such examples. They do not fit into a regular syntactic system. For
example, they do not allow successive cyclic operations. These might be the interpretive systems on the meaning side, on the edge of syntax. They use operations similar to those belonging to core syntax, but with different properties. The same type of constraint is at work on the operations in phonology like Heavy NP Shift. These operations do not allow iteration either. They are assumed to be located on the external interface between FL and the sensorimotor system. If the aforementioned operations on the meaning side obey the same constraint as those working on the sound side, this suggests the possibility of significant study of thought systems.

The processes of discovering what the interface conditions are and how to satisfy them proceed hand in hand. This is the current state of linguistic researches.

7.3. Question Group 3:

**Question:** Granting the common background of methodological minimalism as a component of scientific inquiry, are substantive minimalist questions ever asked in other scientific domains? (p. 136)

**Answer:** In devising the theory of quarks (theoretical constructs assumed to constitute the hadron), American physicist Murray Gell-Mann reconstructed the data using the numbers 2 and 3, even though there was evidence for the existence of seven quarks. Further experimentation showed that the reconstructed system was correct. Concerning the discovery of Pluto, a postulated entity called Pluto turned out to account for the perturbations observed without causing complication to physical theories, even though there is a question as to whether the entity may or may not be a planet. Chemistry also offers many illuminating examples. As an example let us direct our attention to the problem of the atomic weights of elements. The theories of the leading chemists of the eighteenth century led to proliferation of elements and chemical atoms. In the early nineteenth century "Prout observed that the atomic weights of the elements were

---

8 This outline of Chomsky's answer is supplemented by my annotation.
pretty close to integral multiples of the atomic weight of hydrogen,” and using a kind of minimalist approach came up with the proposal called “Prout’s hypothesis” proposing a system with whole numbers. This proposal “stimulated heavy experimental inquiry trying to find the exact deviation of the atomic weight of heavier elements from an integral multiple of hydrogen and to try to find some explanation” (p. 137). Only after isotopes were discovered in the 1920s and atomic theory was developed did it become clear that Prout’s hypothesis was fundamentally correct, because it turned out that heavier elements basically consist of integral multiples of protons, (the atomic nuclei of hydrogen), with systematic modification of the numbers by isotopic effects. Technically speaking, the difference between charge and mass can be accounted for systematically by isotopic effects (by the number of neutrons). Thus, the fundamental explanation was given as the result of reanalysis of the apparently messy data in terms of a new theoretical perspective. D’Arcy Thomson’s achievement, discussed in Section 3, is exactly the result of a Minimalist pursuit.

In sum, the core points of the minimalist research attitude, which are revealed in Chomsky’s answers are: (1) No authenticated results have been produced since the introduction of the P & P approach. (2) Even apparently established principles and the basic data supporting them must be scrutinized in terms of the minimalist criteria. (3) Some principles that have been regarded as part of the core syntax might be better accounted for if they are treated as properties of the internal syntax-phonology interface, obeying the same constraints as those on the external interface. This may indicate the possibility of significant study of thought systems. It must also be recalled that the surface-related semantic interpretation involves the edge positions. Since the finely structured functional categories typically contain edges, Chomsky acknowledges the importance of the cartographic studies as leading to a closer inquiry into the nature of interface relations and conditions they impose on a well-designed LF. Those are ways of approaching the interface systems from inside syntax. Another way is to approach it from outside by utilizing the results of the studies on discourse, pragmatics and the like, which is not alluded to in the text.
8. Conclusion

Thanks to the development of generative grammar, which has yielded a substantial “body of doctrine,” the possibility of an additional assumption has emerged, namely language approaches a kind of optimal design. Following this line, we have witnessed a flourish of very productive research activity checking important research results, in particular using well-known works on a wide variety of languages. Chapter 1 provides quite a number of concrete examples supporting or refuting the theories under discussion, which are drawn mainly from Indo-European languages. In this respect it is a valuable contribution, while a very scanty use of relevant examples from Chinese, Japanese, and Korean, which have been studied rather extensively in the generative framework, suggests the need for greater efforts to gain wider publicity on the part of those engaged in research concerning these languages. At the same time it is hoped that more research on typologically different languages will be carried on and utilized to fill in some gaps in the discussion.

An insightful comment can be found in Chapter 1, in which the editors state that optional movement transformations are discarded, because the MP does not allow unmotivated movements, that is, movements which do not eliminate uninterpretable features. Thus, the “subject inversion” in Italian and other Null Subject Languages, which was an optional movement, underwent a reanalysis, resulting in the discovery that this process involves “a necessary focal interpretation of the subject in postverbal position, or a topic interpretation signaled by an intonational pause and destressing (Belletti (2001))” (p. 34). This account applies to almost all the right dislocated elements with stress, which carry secondary focus interpretation implying additional new information. (See Rochemont (1986), Rochemont and Culicover (1990).) Furthermore, in Japanese a nominative (ga)-marked subject can be replaced by an inherent case (kara)-marked subject under certain conditions (Inoue (1998)). This replacement crucially involves the first and second person subjects, the choice of which depends on modality, speech acts, and the like, relevant to the study of interface conditions. These types of data may provide a basis for investigating the content and structure of the interface systems. The minimalist account suggested here encourages research on the principles governing the interface systems, in particular as regards the relation to those related to core syntax.
It is rather curious that Alan Turing’s contribution to biology is emphasized, without mentioning his contribution to cognitive science. The idea behind the Turing machine, that cognitive mental processes are operations defined on syntactically structured mental representations, has been utilized rather extensively in cognitive science since its inception about forty years ago. This much might be consonant with Chomsky’s theory, but the idea that this account is valid as a theory of cognition as a whole may not be compatible with his idea. (See Fodor (2000) for details.) However, some research in the brain sciences is now heavily dependent on structural representations proposed by generative grammar, even though this is not explicitly stated in these lectures. Chomsky mentions the recent studies on the electrical activity of the brain (event-related potentials, ERP), which show distinctive responses to semantically and structurally nondeviant/deviant expressions. He states that “the current significance of the ERP studies lies primarily in their correlations with the much richer and better-grounded computational and representational theories” (generative theories) (Chomsky (2000: 24–25)).

There have been marvelous advances in mechanical devices used to measure brain activities. To test each device, experiments using basic linguistic structures offered by generative grammar are getting to be employed. This means that the results of ERP and other advanced measuring research based on linguistic analysis can be compared with the test results of other functions of the brain, bringing these two into the same framework for comparison. This might be one step toward the unification of research on the mind and body.

What is novel about this book is the overview given by Chomsky of the status of the MP as a body of a kind of research guideline with a view to unifying research on the mind and body, even though this looks like a very remote goal at present. Thanks to the interview record in Chapter 4, many unsettled problems and tentative solutions have been made explicit, which peaks our awareness of the vast amount of work that awaits us before anything definite can be said either in support or in refutation of the MP.

9 Similar ERP experiments were conducted by Hagiwara et al., using Japanese subjects and data. (See Hagiwara et al. (2001).)
REFERENCES


Center for Language Sciences
Kanda University of International Studies
1-4-1 Wakaba, Mihama-ku
Chiba-shi 261-0014
e-mail: inoue@kanda.kuis.ac.jp