

Some Consequences of the Levels of Adequacy*

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1. Introduction

Initially developed in a short monograph titled *Syntactic Structures* published in 1957 (Chomsky 1957), generative grammar can be characterized as an alternative paradigm to (American) structural linguistics. In the early 1900s, structural linguistics emphasized the blank slate as the initial mental state of children: children learn a language by exposing themselves to the environment wherein they are raised. Empiricism is thus a prominent feature of Structuralism. On the other hand, the concept of generative grammar is based on the innateness hypothesis, which states that children have an in-born ability to acquire a language.^{1,2} Specifically, what enables children to acquire a language is an in-born mechanism called the Faculty of Language (FL) or Universal Grammar (UG).³

To clarify the exact content of UG or FL, Chomsky (1965) establishes three levels of adequacy. In other words, each level of adequacy, discussed

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in the current paper, is a criterion that a language theory or a grammar has to satisfy (Chomsky 1964: 29, 1965: 24-26). Chomsky (1964) presents the three levels of adequacy, stating that the ultimate goal of generative theory is to achieve these levels of adequacy.

The purpose of this paper is to discuss some proposed levels of adequacy that proponents of generative grammar have hypothesized as its theoretical goals, and to show the process through which the theory of generative grammar has advanced toward the attainment of these levels of adequacy.

The discussion of these points has several merits. First, the discussion, functioning as a very brief overview of the history of generative grammar, will allow readers to understand each achievement at a particular stage of the theory's development as well as the overall research aim of generative grammar. Second, as the Minimalist Program naturally extended from previous frameworks such as the Principles and Parameters (P&P) approach, understanding the P&P approach and other earlier frameworks will allow linguistics researchers to more clearly identify the research tasks at hand. Third, the current paper offers some pedagogical merits. With an understanding of the historical development of generative grammar in relation to levels of adequacy, younger researchers will approach the research tasks under the Minimalist framework with the invariant ultimate aims of generative grammar in their minds. To achieve these purposes, this paper will begin by discussing the three levels of adequacy and proceed to the fourth, more advanced level of adequacy, that is, evolutionary adequacy.

2. Rich UG

2.1. Observational Adequacy

In this section, I will show the specific contents of the first two levels of adequacy. Chomsky (1964: 29, 1965: 24-26) establishes three specific types of adequacy as follows: observational adequacy requires a language theory or a grammar to be capable of distinguishing adequate expressions from inadequate ones; descriptive adequacy requires it to appropriately describe the content

of UG; and explanatory adequacy requires it to capture the fact that children acquire a language regardless of the environment in which they are raised.

The first type of adequacy is observational adequacy. One very simple method for achieving observational adequacy (i.e., to distinguish legitimate expressions from illegitimate ones) is to make a list consisting of legitimate expressions (Chomsky 1964: 34). If one tries to achieve complete observational adequacy, the entries of the list have to be infinite (since the whole set of human speech is virtually infinite). Therefore, completing such a list would be a very difficult (or impossible) task.

However, observational adequacy has played an interesting role in theorizing and understanding the differences between generative grammar and structural linguistics. First, to make a list of possible expressions without any theoretical account is a very primitive study approach. Thus, Chomsky characterizes this level of adequacy as the lowest in language research. Second, and more importantly, structural linguistics until the end of functioning as a main paradigm had only paid attention to the achievement of this level of adequacy. On the other hand, generative grammar, in its earliest stages of development, had a goal of more advanced levels of adequacy. In other words, by offering the three levels of adequacy, Chomsky made it clear that the research method of structural linguistics—the most influential paradigm not only in the field of linguistics but also in several other fields at the time—was wholly unsatisfactory because any fruitful research should strive for a more advanced level of adequacy. Thus, proponents of generative grammar paid particular attention to a more advanced level of adequacy as early as in the 1950s, when Chomsky's first book was published.

2.2. Descriptive Adequacy

The next, more advanced level of adequacy is descriptive adequacy. To achieve descriptive adequacy, a theory has to describe the content of UG. To put it simply, to advance toward achieving this level of adequacy, a theory has to give explanations to as many constructions as possible. Of course, one methodological question is, under what situation we can say that an adequate

explanation of specific constructions has been successfully given.

In the 1960s, the term “explanation” was used to specify both the structural description and the structural change of a given construction. Therefore, significant effort has been made to capture structural descriptions/changes of a wide variety of constructions. For this purpose, many transformational rules have been proposed. In particular, in the 1950s and 1960s, research tasks of this kind flourished: many researchers focused on the achievement of descriptive adequacy, and many classes of constructions were discussed. Addressing the problem of descriptive adequacy was given high priority because it showed the superiority of generative grammar over the former structural linguistics paradigm.

In the 1970s, many individual rules were combined into some abstract rules. In other words, the research trends at the time tended to factor out some common properties and present them in an abstract form. This abstraction is very natural when the purpose of generative grammar—to reveal the content of UG—is considered. Specifically, it seems implausible that children are born with the knowledge of specific linguistic rules. Another reason for the abstraction of each rule is that children can learn any language regardless of their nationality and surrounding environments. In other words, FL should be general enough for children to learn any language. These points lead to the assumption that rules specified in UG should be in an abstract form.

The theoretical demand for abstraction led to the combination of many specific rules into just two representative movement rules: A-movement and A'-movement. Moreover, the pursuit of abstraction moved forward. The two types of movement rules were combined into just one rule called Move α . Operation Move α claimed, “Move anything anywhere” (Chomsky 1980, 1981, Chomsky and Lasnik 1993). Many types of syntactic movement were considered to be governed by Move α . Furthermore, significant effort was made to reduce the syntactic phenomena that were seemingly not related with movement to the movement-related phenomena controlled by the Move α rule. A representative study of this line of research, for example, is May (1985), which, based on the assumption of Chomsky’s (1981) Move α , offers an account of

scope relations that do not emerge from the surface order of items involved.

Importantly, although the rules controlling movement were combined into one simple rule, many auxiliary and complementary rules work with Move α to generate grammatical sentences and rule out ungrammatical sentences. Therefore, UG still contained many rules. Moreover, it was natural for many researchers focusing on descriptive adequacy to consider UG with all of its descriptive apparatuses.

3. Explanatory Adequacy and the P&P Approach

Let us turn to the more advanced level of adequacy, that is, explanatory adequacy. To achieve this level of adequacy, a theory has to account for the language acquisition of children. The question is then about what is observed in the process of a child's language acquisition. One observation is that children pass through deterministic stages of development, no matter what language they are learning. In other words, all children without cognitive disabilities embark on a fixed route in a step-by-step fashion. No child skips a developmental stage; nor does any child experience two stages in a reverse order. Moreover, children learn particular linguistic matter in a particular period. Some other facts concerning children's language acquisition are as follows: (i) The period that children spend learning a language is very short, compared to that of adults learning a non-native second language; (ii) The linguistic level that children achieve is universally almost the same, which implies that the differences among languages are not so large. This implication is contrary to the claim of the American structural linguist, Joos, who said, "languages could differ from each other without limit and in unpredictable ways" (Joos 1957: 96). These surprising facts require the content of UG to be restricted to the acquisition of only one native language by children based on their surrounding speech inputs, which are meager in quality since they may contain many errors, and are poor in quantity since the children's exposure to the target language is very limited.

This process of language acquisition is very roughly illustrated in (1).

(1) Linguistic data \rightarrow $\boxed{\text{AM}}$ \rightarrow Grammar

(Chomsky 1967: 401)

(1) shows that children have some innate Acquisition Mechanism (AM), which can be paraphrased as FL. FL takes surrounding linguistic data as its input and constructs grammar as its output. Based on this illustration, we can assume that the process through which linguistic data are processed is deterministic, short, and invariant. This indicates that in order to account for the facts of child language acquisition, the content of UG should be restricted and invariant. This is because if UG had a full set of machinery, the acquisition process would entail many routes. This would result in children having too many possible options for determining the order in which they might acquire or activate each mechanism. This method of acquisition would also render the period of acquisition a prolonged one, full of variety among individuals and languages. This scenario, which would be produced by the idea of a rich UG, is simply implausible. When we take into consideration the process of a child's language acquisition, UG must not be rich in its content.

We now face the tension between descriptive adequacy and explanatory adequacy at the same time. However, the seemingly unsolvable tension is resolved (or reduced) under the P&P approach, which was prominent in generative grammar in the 1980s.

Usually said to have been first outlined in Chomsky (1981), the P&P approach was fully established in Chomsky and Lasnik (1993). The approach hypothesizes that UG consists of a small number of principles and parameters. Importantly, some researchers argue that the P&P approach satisfies both descriptive and explanatory adequacy (Boeckx 2006: 61, Hornstein et al. 2005: 5). In terms of descriptive adequacy, UG is rich enough to account for many types of constructions due to about a half dozen principles and the effective interactions among them. Further, the level of explanatory adequacy is satisfied at the same time because for children, the task of learning a language is merely to set the parameter values in accordance with the linguistic data to which they are exposed. Therefore, children's developmental stage is narrow enough for them to move in a deterministic fashion when learning a language.

4. The Fourth Level of Adequacy

4.1. An Unsolved Problem

The previous section has demonstrated the possibility of using the P&P approach to reduce the tension between descriptive and explanatory adequacy. Although not recognized by many researchers in the 1980s, the P&P approach may contain a theoretical drawback. It became obvious, especially in the 2000s, that the approach can likely not explain how human language capacity has evolved throughout human history. To understand this problem, recall that the P&P approach assumes that UG contains a few (but not many) principles and parameters. This theoretically suggests that children innately have these principles and parameters established in their brains. To explain the evolutionary scenario of UG with rich machinery, we would be forced to conclude that at some stage of human evolution, a mutation equipped humankind with all of the current principles and parameters simultaneously. Furthermore, this event is limited to humans because, as Chomsky (1975: 43-44) correctly pointed out, no other creature has so far been found to be equipped with some subset of the entire human language system. The hypothesis that the entire set of UG machinery emerged all of a sudden at a particular stage of human development is rather tenuous from an evolutionary perspective. Thus, as long as we adhere to the P&P approach, we cannot offer a plausible evolutionary hypothesis.

In the 1990s, theorists of generative grammar faced this challenge, which had gradually become clear within the field of linguistics. Since then, there has been a growing consensus that a linguistic theory must explain the evolution of the human FL. In other words, it has to satisfy the level of “evolutionary adequacy.”

Researchers did not recognize the importance of the problem of evolutionary adequacy at the advent of the P&P approach. Rather, the relative significance of this problem increased as researchers’ understanding of the FL system deepened. During the crystallization of the P&P approach in the 1990s, Chomsky and his followers came to realize that some principles are redundant when they explain the same linguistic phenomena and overlap in their explana-

tory power. For example, in the review article of Chomsky (1986a, b), Fujita (1989) points out theoretical redundancies in the P&P approach.⁴ The overlap in explanatory power is a problem in constructing a linguistic theory, as suggested by Chomsky and Lasnik's (1993: 515) clear insight:

- (2) ..., it has been a fruitful working hypothesis that in its basic structure, the language faculty has properties of simplicity and elegance that are not characteristic of complex organic systems, ...

The words "simplicity" and "elegance" in (2) suggest that there should be no redundancies when explaining the human FL. However, the P&P approach retains many overlapping explanatory mechanisms. Retrospectively, the P&P approach is too rich in terms of its explanatory mechanisms. While many researchers did not seem to notice this problem or to take it seriously, Chomsky (2004) was the first to raise the important question of "how perfect is language?" According to Chomsky, a theory should not be redundant; it should be economical. In the 1990s, he urged linguists to address how a theory becomes simple and elegant, following the working hypothesis in (2).

In practice, Chomsky then rejected most theoretical apparatuses that were stipulated or assumed as lacking a fundamental reason for their existence, claiming that what remained would be considered virtual conceptual necessity (Chomsky 1993, 1995a). In other words, a linguistic theory should be based on only necessary assumptions.

Following this line of reasoning, Chomsky claims that Merge is the virtual conceptual necessary tool in the human FL given that human speech is not uttered word by word: words are combined through the Merge operation. It seems that the recognition of the importance of Merge gradually allowed many linguists to acknowledge the emerging problem of evolutionary adequacy.

In pursuing a minimalist method of endeavor, Chomsky (2004: 14) clearly describes the relationship between Merge and the evolution of human language. Under the Minimalist framework, a language capacity is composed of syntax, sound, and meaning. The central part of syntax is the set-forming operation of

Merge. This operation emerged about 50-100,000 years ago to connect meaning with sound, both of which had existed before its emergence (Chomsky 2005, 2007b, 2013). In this sense, Chomsky claims that the emergence of Merge is a crucial event in human history.

Recall that the guiding intuition behind theorizing language is that language is simple and elegant (see (2)). This intuition leads us to assume that the syntax is connected with sound and meaning in an optimal way. Therefore, the question of “how perfect is language?” can be answered in the following way: syntax is the perfect solution to the demands and conditions of sound and meaning, which are technically called interfaces and are systems outside of syntax.

5. Third Factor Principles

5.1. From Bottom Up

Let us turn to some consequences of the idea that language is perfect or that syntax is an optimal solution to a sound and meaning pair. Recall that under the Minimalist framework, the principles that were assumed in the P&P approach must instead be derived in the sense that the rich mechanisms that were assumed to exist in the P&P approach were merely generalizations, but not explanations. Therefore, one of the central tasks of linguists under the Minimalist framework is to derive these generalizations from the properties of other organic and natural systems. Another is to show that this task leads to the discovery of hitherto unknown linguistic and biological properties. Chomsky (2007a) makes the following statement:⁵

- (3) The MP [Minimalist Program] seeks to approach the problem “from bottom up”: How little can be attributed to UG while still accounting for the variety of I-language attained, relying on third factor principle?

(Chomsky 2007a: 4)

(3) clearly indicates that UG should contain as little apparatuses as possible, and that its properties should come from third factor principles. Note that

Chomsky (2005: 6) classifies factors concerning the development of individual languages into three theoretically possible categories: (i) genetic endowment; (ii) experience; and (iii) principles not specific to the faculty of language. The last of these factors is called the third factor (in language design). The P&P approach imposed a heavy burden on the first factor, resulting in the rich content of UG. However, the Minimalist Program tries to reduce the responsibility of the first factor to minimum (or ideally zero) and to derive the UG principles from the general properties of computational efficiency common to organisms and the natural world. The Minimalist Program, therefore, tries to offer a deeper understanding of the empirical and theoretical contributions made under the P&P approach.⁶ In addressing this task, the Minimalist Program assumes that the FL is an optimal way of the connection with sound and meaning in the sense that the apparatuses of UG should follow third factor principles by being derived from the characteristic properties of other organic systems and principles of the natural world.

5.2. On (A)Symmetry

Finally, let us turn to the notion of “symmetry,” which is discussed in recent linguistics literature. Recent linguistics literature considers symmetry to be important, especially in the labeling algorithm. The notion of labeling has attracted a great deal of attention since Chomsky (1995a, b) (although the notion of the label itself appeared as a theoretical construct as early as in Chomsky (1955/75)). An important point concerning labeling is that it does not occur in the surface forms of linguistic expression (hence, it is not audible or visible), but it plays important roles in both semantic and phonological interpretations.

Chomsky (1995a, b) assumes labeling to be a sub-operation of the Merge operation. However, Chomsky (2000, 2007a, 2013, 2015) subsequently modified the Merge operation by claiming that the labeling algorithm is independent from the Merge operation. He calls this labeling operation Minimal Search. As a result, Merge is not responsible for labeling. The application of Merge to two units is illustrated in (4).

$$(4) \text{ Merge } (\alpha, \beta) = \{\alpha, \beta\}$$

(4) shows that Merge is a symmetrical operation in the sense that neither α nor β becomes a label of a whole set at the point of the application of Merge. Merge is thus projection-free (Collins 2002, Chomsky 2007a, 2013, 2015).

Importantly, in discovering the nature of the label and the labeling algorithm, Chomsky placed his theoretical basis upon the notion of symmetry, which is abundant in the natural world. This means that considerations of (a-) symmetry in language theory have shed light on the important tasks, which are to consider the natural world and to ask to what extent symmetry is important in the natural or biological world if the properties of the human FL are ultimately derived from or attributed to biological properties. It may be true that to address these issues beyond the speculative level requires an understanding that exceeds our current level of understanding.⁷ However, the development of generative grammar has overcome some difficult goals. Difficult as the goal of seeking third factor principles seems, it is important to keep this goal in mind because deepening understanding of third factor principles in a step-by-step fashion will lead to the achievement of the seemingly insurmountable level of adequacy, evolutionary adequacy.

Notes

1. Chomsky's earliest statement on this point is found in Chomsky (1959: 57).
2. In Chomsky and Ronat (1979), Chomsky remarks that a psychological perspective of language learning was inspired by the review of *Syntactic Structures* by Lees (Lees 1957), which addresses the learning problem.
3. The terms FL and UG are often used synonymously with each other. Precisely speaking, UG is a theory of the initial state of FL. Despite admitting this point, the current paper also uses the terms FL and UG interchangeably because the discussion of the current paper does not hinge on the precise distinction.
4. Fujita (1989) focuses on the following theories/principles that regulate movement of items: Subjacency, Empty Category Principle, (antecedent) government, and attempts to subsume them to Binding theory. I refer interested readers to Fujita (1989).

5. The earliest statement by Chomsky on a relevant point is in Chomsky (1965: 59). A similar remark is also observed in Chomsky (1975: 92).
6. In this sense, the Minimalist Program is a natural extension of the P&P approach under the generative enterprise of seeking to reveal the properties of the human FL. Some researchers (Pinker and Jackendoff 2005), however, have claimed that the Minimalist approach is radically different from the P&P approach. This claim is not correct under the current view.
7. Another descriptive problem concerning symmetry is adjuncts, which are considered to be incorporated into a structure by means of pair-Merge operations. Pair-Merge is a subcase of Merge but forms an asymmetric ordered set, instead of unordered set created by (usual) set-Merge operations. Chomsky (2004: 118) attributes its presence to interface conditions of the C-I interface, assuming that it yields predicate composition. However, questions remain to be unsolved of why such ordered asymmetric relation, if any, needs to be assumed and whether the asymmetric nature follows from any principles of third factor. Importantly, main spines of clausal structures are constructed by set-Merge, which implies that pair-Merge is possibly epiphenomenon in linguistic structures (and language-theorizing as well). I thank an anonymous reviewer for bringing this issue to my attention.

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