

The Evolution of Lexicon in Generative Grammar

Haojie Li

School of Foreign Languages, Southwest University of Political Science and Law, Chongqing, China

Tongde Zhang

East China University of Technology, Fuzhou, Jiangxi, China

Abstract—The lexicon is a microcosm of the development in generative grammar. It has its own idiosyncrasy from no status at the outset to the position of all variations among languages in generative grammar. Recently, the lexicon is much greatly simplified in Neo-constructivism, which conforms to the fact that language is a recent and emergent system in biolinguistics and meets the needs of a genuine explanation: learnability and evolvability. Future research on the lexicon will proceed in these directions.

Index Terms—lexicon, generative grammar, Neo-constructivism, functional category

I. INTRODUCTION

Generative grammar was created by Chomsky in 1957, which has a history of development for 65 years. In these 65 years, many major changes have occurred in its theoretical structures and theoretical contents. However, generative grammar survives and develops in changes, becoming a unique scientific phenomenon. The lexicon is a microcosm of the development in generative grammar. A lexicon, which lists all the lexical items/words in the language and their linguistic properties, is a dictionary, an abstract dictionary that is stored in the mind (Xu, 2009, p. 92). From no status at the outset to the position of central importance, that is, the position of all variations among languages, the lexicon has its own idiosyncrasy, which constitutes the unique track of development in generative grammar. In light of Smith (2004, p. 47), there is only one human language apart from differences in the lexicon. Therefore, it is necessary to tease out the evolution of lexicon in generative grammar.

This paper is organized as follows. Section 2 examines the lexicon from early stages of generative grammar to GB theory. Section 3 gives the lexicon in MP framework. Section 4 touches upon recent development of the lexicon in generative grammar. Section 5 concludes the paper.

II. LEXICON FROM EARLY STAGES OF GENERATIVE GRAMMAR TO GB THEORY

There was no lexicon in the early stage of generative grammar (Cheng, 1999, p. 13). At that time, all syntactic phenomena were processed by phrase structure rules and transformations. Now that verbs have a variety of selectional properties, there are various rewriting rules for sentences, as illustrated in (1).

- (1) a. $S \rightarrow [NP \text{ } [vp \text{ } V]]$
- b. $S \rightarrow [NP \text{ } [vp \text{ } V \text{ } NP]]$
- c. $S \rightarrow [NP \text{ } [vp \text{ } V \text{ } NP \text{ } PP]]$
- d. $S \rightarrow [NP \text{ } [vp \text{ } V \text{ } NP \text{ } NP]]$

In (1), (1a) is the intransitive structure, (1b) is the transitive structure, (1c) is the dative structure, and (1d) is the double object structure.

However, rewriting rules like (1) simply express the unique properties of lexical items. These rewriting rules cannot represent the syntactic phenomena completely, that is, they are inadequate. Therefore, there must be a part (that is, the later lexicon) in the syntax to define which verbs are transitives and which are intransitives. On the other hand, these rewriting rules also bring a lot of problems. They are huge in number and lack of inner connections with each other, making the syntactic component very complicated.

By the 1960s, syntax and lexicon were separated. The lexicon was used to define the unique features of each word, including its phonetic features, syntactic features and semantic features, as shown in (2).

- (2) a. murder: V; [NP]
- b. die: V; []

In (2), aside from the category “V” of “murder” and “die”, the transitivity of the verb is also marked via distributional frame in the lexicon. In the distributional frame of “murder”, NP is followed by the blank, which denotes that the verb “murder” selects a noun phrase as its object, so “murder” is a transitive. In the distributional frame of “die”, there is not any category mark, which means the verb “die” does not select any element, thus “die” is an intransitive.

The lexicon and the syntax are connected through the Projection Principle, as illustrated in (3).

(3) Projection Principle

Lexical information is syntactically represented. (Haegeman, 1994, p. 55)

The separation of the syntax and the lexicon has great significance. It greatly simplifies the analysis of the syntactic analysis, and even makes the phrase structure rules lose the necessity of existence, which are eventually canceled. The part opposite to the lexicon is called the computational system, which forms the syntactic part of the language together with the lexicon.

Chomsky (1970) divides morphology into two kinds: inflectional and derivational. Inflectional morphology, which is operated by the syntax, refers to agreement, tense and the like, while derivational morphology, which is stipulated by the lexicon, denotes affixes of categories and so on. This constitutes the Lexicalist Hypothesis, which plays an important role in controlling the ability of transformation and simplifies the syntactic analysis. Chomsky (1970) is the start of Lexicalism.

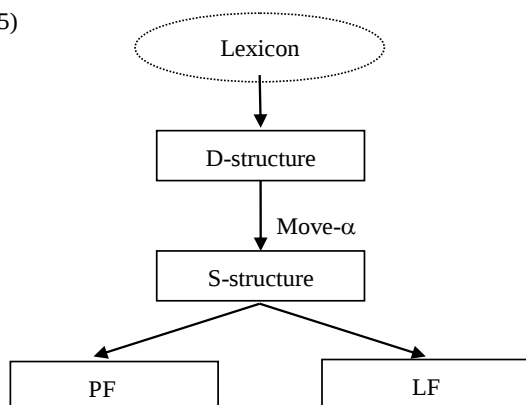
(4) Lexicalist Hypothesis:

The syntax neither manipulates nor has access to the internal form of words.

(Anderson, 1989, p. 1)

Generative grammar has entered the stage of GB in the 1980s and the status of lexicon in the syntax is not clearly defined, although it is taken as a starting point of syntactic computation. The model of syntactic derivation in GB Theory is illustrated in (5) (Chomsky, 1986, p. 68).

(5)



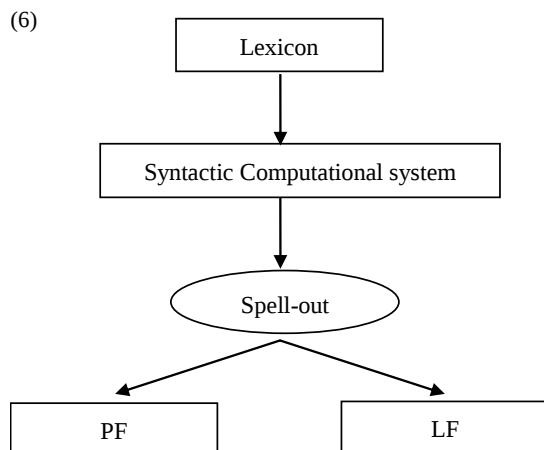
This model in (5) is often referred to as the T-model because of its inverted T shape. In the T-model grammar, the lexicon is represented by the dotted line, which shows that the lexicon does not belong to the syntactic process. Apparently, Chomsky wants to give the lexical-morphological process a certain independent status. This idea is confirmed by Chomsky (1986), which mentions that there should be a lexical component in the system of grammar. According to Di Sciullo and Williams (1987, p. 3), the lexicon is the storage house for listemes, that is, “objects of no single specifiable type (morphemes, words, idioms, and perhaps intonation patterns, and so on) that fail to conform to established laws” and it, like a prison, “contains only the lawless, and the only thing that its inmates have in common is lawlessness”.

In GB Theory, many lexical items are stored out of order in the lexicon. Most of them are substantive items, a few are functional items. What is stored in GB is lexical items without any lexical morphological changes. Take the verb “like” for example, there is only the infinitive form “like” in the lexicon and there is no lexical item “liked”, which has the morphological change. The tense form “liked” is obtained by moving the original form of “like” to the head of “I” and adjoining it with the suffix “-ed” in the process of syntactic derivation. This process is usually called the derivational morphology.

In a nutshell, the lexicon describes the individual, unique properties of lexical items, such as their phonetic, syntactic, and semantic properties. In terms of research strategy, the general trend of generative grammar at that time is to use abstract, simple principles to deal with computational systems, and to transfer the parts that cannot be dealt with by these principles to the lexicon. This strategy continues to work in MP.

III. LEXICON IN MP FRAMEWORK

The paper “A minimalist program for linguistic theory” published by Chomsky in 1992 symbolizes the establishment of MP. This paper was later included in Hale and Keyser (1993), the title of which used minimalist program (MP for short) for the first time. The grammar model of MP is simplified on the basis of the T-model in GB theory. Specifically, D-structure and S-structure are cancelled, and PF and LF are retained, as shown in (6) (Chomsky, 1995).



In the grammar model of MP, the syntactic stage is composed of two components: lexicon and syntactic computational system. In other words, the lexicon becomes one of the formal syntactic stages in MP. The syntactic computational system selects lexical items from the lexicon, which are derivated directly to PF and LF, and all the principles apply only to PF and LF.

Chomsky explicitly limits language variation to the part of the lexicon, which is confined to two main aspects. One is the way in which concept (meaning) is combined with sound. Because of the conventionality of this combination, the so-called “Saussure’s arbitrariness”, it has become an important source of linguistic difference. Another major aspect is the functional category, that is, the (inflectional) morphology in the traditional sense. The lexical items in the lexicon of MP belong to the inflectional morphology, that is, morphological forms of each lexical term have changed. Take the verb “like” for example again, in GB, there is only the infinitive form “like” in the lexicon and there is no lexical item “liked”, which has the morphological change. However, in MP, “like”, “likes”, “liked”, and “liking” are taken as different lexical items listed in the lexicon. In other words, lexical items are stored in the lexicon in units of concrete forms of words. Each lexical item can be regarded as the sum of various features, including phonetic features, semantic features and grammatical features, for instance, “like” and “likes” have different person features, “like” and “liked” have different tense features.

In MP, the lexicon is not simplified and decomposed like the syntactic component but is given more contents and a more prominent position, to the extent that it is almost on par with the syntactic component (Chomsky, 1995, 2008). The lexicon in MP has the following characteristics: generativeness, autonomy, multi-module and multi-level, and projectiveness (Cheng, 2018).

First, the lexicon in MP is generative. Since the mainstream theory of generative grammar contends that the starting point of syntactic computation is lexical items, the lexicon undertakes the task of lexical item formation, that is, the lexicon is responsible for combining morphemes into lexical items and endowing lexical items with semantic and phonological interpretations. In this way, the lexicon has changed from a static list to a dynamic computational system. Thus, the lexicon has become a module of the grammar system, with functions that are highly similar to the syntax.

Second, the lexicon in MP is autonomous, that is, lexicon and syntax are closed to each other in information, and the two are independent and different from each other. Lexical rules can change the categorial and subcategorial characteristics of objects, but syntactic rules cannot. For example, the word formation operation “translate→translate” not only makes the verb into a noun, but also removes the former’s transitivity, that is, the ability to carry NP complements obligately. “Lexical Integrity Hypothesis” proposed by Lapointe (1980) maintains that syntactic operations cannot enter and affect the internal structure of lexical items. “No Phrase Constraint” proposed by Botha (1983) contends that morphological operations cannot use structures generated by syntax, that is, phrase structures cannot be applied to word formation. Lieber and Scalise (2005, p. 2) point out that “In fact, the two principles of Lexical Integrity Hypothesis and No Phrase Constraint are designed to prevent cross-module interaction: Lexical Integrity Hypothesis prevents syntax from ‘seeing’ morphology, and No Phrase Constraint prevents morphology from ‘seeing’ syntax.”

Third, the lexicon has the characteristics of multi-module and multi-level. Starting from the first complete lexicon model proposed by Halle (1973, pp. 3-16), until now, it has always included several independent internal modules and the main parts are as follows: (i) A list of morphemes, which is used to enumerate all morphemes in a certain language, indicating their individual properties: free or bound, root or affix, what part of speech they belong to, what subcategorization they have, what meaning they have, etc.; (ii) word formation rules, which are responsible for combining words, determining their morphological core (Williams, 1980, pp. 203-38), and penetrating the features of that core into the word (Lieber, 1980). Sometimes movement rules are also used to adjust the structural relationship of each component in the word, so that the semantics can be correctly reflected (Roeper & Siegel, 1978, pp. 199-260; Hale & Keyser, 2002); (iii) Interpretation rules, which are responsible for the phonological and semantic expression of words. (iv) Filters, which filter out the words that are compliant but not recognized (possible words), keeping only the accepted

parts (actual words), and forming a complete list of words for options of syntactic operations.

Each module in the lexicon generally needs to set several derivation levels internally. For example, just to solve problems related to stress, some researchers, who study on phonology-morphology of the lexicon, such as Siegel (1979) and Selkirk (1982), set up four levels for the English lexicon: The first level is affix boundary affixes, mainly derived from Latin, generally attached to the bound root, which can trigger morphological changes such as stress transfer; the second level is the word boundary affixes, mainly derived from Germanic languages and generally attached to the free word base, without triggering morphological and phonological variations; the third level is compound, which is able to trigger stress transfer; the fourth level is regular inflections, which cannot trigger stress transfer. The “Ordering Hypothesis” proposed by them stipulates that the affixes of each level can only be attached to the components of the same level or the next level, and there cannot be any order reversal.

Finally, another important characteristic of the lexicon is the projectiveness, that is, it largely determines the operation of syntax. After years of research, the lexicon contains more and more information, mainly including (i) a system for describing the inherent characteristics of lexical items, (ii) subcategorization frame, (iii) insertion rules of lexical items, (iv) theta grid, (v) various inflectional variants of lexical items, etc. (Chomsky, 1965, 1981, 1995). Mainstream theory contains various principles, which ensure that this information is embodied in syntactic operations. The well-known Projection Principle stipulates that lexical information must be obeyed at every level of syntax; this principle is later extended to Theta Theory, stipulating that syntactic operations must not violate the theta grid in the lexicon. In MP, the syntactic operation basically depends on the features specified by the lexicon, and the features are not added, not reduced, or tampered with according to the requirements of the condition of inclusiveness. As Adger (2010, p. 2) has argued: “MP can be viewed as a lexicon-driven combinatorial system.” This theoretical approach is called “Projection Theory” in that the lexicon specifies a large amount of critical information and determines syntactic operations, and it is also known as the theory of “big lexicon, small syntax”.

To sum up, the lexicon is a department responsible for enumerating the primitive units of syntactic operations (the so-called “syntactic atoms”) and marking their idiosyncrasies in grammar. The lexicon in MP, like the one in GB, stores lexical items. Different from the lexicon in GB, lexical items in MP syntax, which bear sets of features for lexical items, is the ones whose morphology has changed. In MP, the lexicon is not simplified and decomposed like the syntactic component but is given more contents and a more central position, to the extent that it is almost on par with the syntactic part (Chomsky, 1995, 2008). Obviously, this does not conform to the spirit of minimalism.

IV. RECENT DEVELOPMENTS OF THE LEXICON IN GENERATIVE GRAMMAR

In the study of contemporary biolinguistics, a generally accepted hypothesis is that language is a recent and emergent system. The so-called “being recent” means that human beings acquired the capacity for language in a relatively recent development process, which will not be earlier than 200,000 years. “Being emergent” is the opposite concept of evolution. It means that the language system is not formed by slowly and gradually transformation of existing organs. On the contrary, it originated from a single, rapid, and emergent event (Bolhuis et al., 2014, p. 4). According to the general principles of biology, recent and emergent physiological systems are most likely caused by genetic mutations and “embedded” in a certain existing system. Moreover, its internal structure must be simple, and only a system that has undergone long-term evolution can it be possible to derive a complex internal structure. From the perspective of biolinguistics, the lexicon is incompatible with the fact that the language a recent and emergent system in that it is so big and complicated.

Chomsky (2021) argues that a genuine explanation has to satisfy the conditions of learnability and evolvability. Obviously, the current design for the lexicon violates the two conditions. For one thing, big lexicon is a barrier for children to acquire language in that it contains too much information. For another, a recent and emergent language system cannot result in such a big and complicated lexicon.

In view of drawbacks of “big lexicon” in MP, since the 1990s, many scholars have turned to an approach called Neo-constructivism (Levin & Hovav, 2005, p. 191) or Generative Constructivism (Ramchand, 2008, p. 4), trying to explain issues related to argument structure from the perspective of syntactic structure on the basis of event structure, such as Hale and Keyser (2002), Borer (2005), Ramchand (2008), etc. Neo-constructivism, which takes the stance of anti-Lexicalism, is different from the traditional Construction Grammar (Goldberg, 1995, 2003, 2006), which considers constructions to be language-specific products that are stored in the lexicon (Sugimoto, 2019).

The Neo-constructivism holds that the semantic structure of an event can be represented by syntactic projections, that is, the syntactic structure is isomorphic with the event structure (Borer, 1998; Travis, 1994, 2000). The content of lexicon in Neo-constructivism has been greatly simplified, which contains simply roots and functional categories. There are two different views for the nature of root, as illustrated in (7).

(7) a. The naked roots view

The root contains no syntactically relevant information, not even category features.

b. The well-dressed roots view

The root may contain some syntactic information, ranging from category information to syntactic selectional information and degrees of argument-structure information, depending on the particular theory. This information is mapped in a systematic way onto the syntactic representation which directly encodes it (Ramchand, 2008, p. 11).

In light of the Borer-Chomsky conjecture, differences in language can boil down to differences in functional categories (Chomsky, 1981; Borer, 1984). Functional categories are organizers of the syntax, which begins with selecting the corresponding root from the lexicon, and then categorizing it by relevant functional category, as shown in (8).

(8) Categorization Assumption

Roots cannot appear without being categorized; Roots are categorized by combining with category-defining functional heads.

(Marantz, 1995; Embick & Noyer, 2007; Embick & Marantz, 2008)

In light of (8), roots must always be categorized by category-defining functional heads, such as *v*, *n*, etc.

It should be avoided that the root functions as the label of the categorized constituent, as illustrated in (9).

(9) a. [_v v √ROOT]

b. [_{√ROOT} v √ROOT] (Alexiadou & Lohndal, 2017, p. 205)

V. CONCLUSION

The lexicon in generative grammar has experienced the development process from nothing to big lexicon. Recently, the lexicon is much greatly simplified in Neo-constructivism. A simple lexicon is in line with the fact that language is a recent and emergent system in biolinguistics. Meanwhile, it also meets the needs of a genuine explanation: learnability and evolvability. Future research on the lexicon should continue in these directions.

ACKNOWLEDGEMENTS

This paper is funded by Chongqing Social Sciences Planning (Ph.D.) Project “A Study on the Generation of Chinese Non-canonical Object Constructions under the Framework of Generative Constructivism” under Grant No. 2021BS030, by Key Project of University-level Higher Education Teaching Reform Research of Southwest University of Political Science and Law “Research on Constructing College English Context Teaching Model Based on Classroom Data-Driven Learning” under Grant No. 2022B07, and by 2020 Western Project of National Social Sciences Fund of China “Reuven Tsur’s Theory of Cognitive Poetics” under Grant No. 20XWW001.

REFERENCES

- [1] Adger, D. (2010). A minimalist theory of feature structure. In Kibort, A. and G. Corbett. (Eds.), *Features: Perspectives on a key notion in linguistics* (pp. 185-218). Oxford: Oxford University Press.
- [2] Anderson, S. R. (1989). Lexicalism and the distribution of reflexives. In G. Booij & J. van Marle (Eds.), *Yearbook of Morphology* (Vol. 2, pp. 1-20). Holland: Foris Publications.
- [3] Bolhuis, J., Tattersall, I., Chomsky, N., & Berwick, R. (2014). *How could language have evolved?* PLoS Biol: e1001934. doi: 10.1371/journal.pbio.1001934. 12(8).
- [4] Borer, H. (1984). Restrictive relatives in Modern Hebrew. *Natural Language and Linguistic Theory*, 2(2), 219-260.
- [5] Borer, H. (1998). Passive without theta grids. In S. Lapointe, P. Farrell, & D. Brentari (Eds.), *Morphology and Its Relations to Phonology and Syntax* (pp. 60-99). Stanford, CA: CSLI Publications.
- [6] Borer, H. (2005). *In Name Only: Structuring Sense (Vol. 1)*. Oxford: Oxford University Press.
- [7] Botha, R. (1983). *Morphological Mechanisms*. Oxford: Pergamon Press.
- [8] Cheng, Gong. (1999). *Linguistic Universalism*. Shanghai: Shanghai Foreign Language Education Press.
- [9] Chong, Gong. (2018). What Should the Lexicon Be Like?—A Biolinguistic Perspective. *Journal of Foreign Languages* 1, 23-30.
- [10] Chomsky, N. (1965). *Aspects of the Theory of Syntax*. Cambridge: MIT Press.
- [11] Chomsky, N. (1970) Remarks on nominalizations. In R. Jacobs and P. Rosenbaum (Eds.), *Readings in English Transformational Grammar* (pp. 184-221). Waltham, MA: Ginn and Company.
- [12] Chomsky, N. (1981) *Lectures on Government and Binding*. Dordrecht: Foris.
- [13] Chomsky, N. (1986) *Knowledge of Language: Its Nature, Origin and Use*. New York: Praeger.
- [14] Chomsky, N. (1992). A minimalist program for linguistic theory. *MIT Occasional Papers in Linguistics* 1. Distributed by Working Papers in Linguistics, MIT.
- [15] Chomsky, N. (1995). *The Minimalist Program*. Cambridge: MIT Press.
- [16] Chomsky, N. (2021). Simplicity and the form of grammars. *Journal of Language Modelling*, 9(1), 5-15.
- [17] Chomsky, N. (2008) On phases. In R. Freidin, C. Otero & M. L. Zubizarreta (Eds.), *Foundational Issues in Linguistic Theory: Essays in Honor of Jean-Roger Vergnaud* (pp. 133-166). Cambridge: The MIT Press.
- [18] Di Sciullo, A. M. & Williams, E. (1987). *On the Definition of Word*. Cambridge: MIT Press.
- [19] Embick, D. & Noyer, R. (2007). Distributed morphology and the syntax/morphology interface. In G. Ramchand & C. Reiss (Eds.), *The Oxford Handbook of Linguistic Interfaces* (pp. 289-324). Oxford: Oxford University Press.
- [20] Embick, D. & Marantz, A. (2008). Architecture and blocking. *Linguistic Inquiry*, 39(1), 1-53.
- [21] Goldberg, A. E. (1995). *Constructions: A Construction Grammar Approach to Argument Structure*. Chicago: University of Chicago Press.
- [22] Goldberg, A. E. (2003). Constructions: A new theoretical approach to language. *Trends in Cognitive Science*, 7(5), 219-224.
- [23] Goldberg, A. E. (2006). *Constructions at Work: The Nature of Generalization in Language*. Oxford: Oxford University Press.
- [24] Haegeman, L. (1994). *Introduction to Government and Binding Theory*. Cambridge, MA: Blackwell Publishers.

- [25] Hale, K. & Keyser, S. J. (Eds.). (1993). *The View from Building 20: Essays in Linguistics in Honour of Sylvain Bromberger*. Cambridge: The MIT Press.
- [26] Hale, K. & Keyser, S. J. (2002). *Prolegomenon to a Theory of Argument Structure*. Cambridge: MIT Press.
- [27] Halle, M. (1973). Prolegomena to a theory of word-formation. *Linguistic Inquiry*, 4(1), 3-16.
- [28] Lapointe, S. (1980). *Theory of grammatical agreement*. Ph.D. dissertation, MIT.
- [29] Levin, B. & Rappaport Hovav, M. (2005). *Argument Realization*. Cambridge: Cambridge University Press.
- [30] Lieber, R. (1980). *On the organization of the lexicon*. Ph.D. dissertation, MIT.
- [31] Lieber, S. & Scalise, S. (2005). The lexical integrity hypothesis in a new theoretical universe. In G. Booij, L. Ducceschi, B. Fradin, E. Guevara, A. Ralli, & S. Scalise. *On-line Proceedings of the Fifth Mediterranean Mor-phology Meeting (MMM5)*. Retrieved November 2, 2022, from URL <http://mmm.lingue.unibo.it/>.
- [32] Marantz, A. (1995). 'Cat' as a phrasal idiom: *Consequences of late insertion in Distributed Morphology*, Ms., MIT.
- [33] Ramchand, G. (2008). *Verb Meaning and the Lexicon: A First-Phase Syntax*. Cambridge: Cambridge University Press.
- [34] Roeper, T. & Siegel, M. (1978). A Lexical Transformation for Verbal Compounds. *Linguistic Inquiry*, 9(2), 199-260.
- [35] Selkirk, E. (1982). *The Syntax of Words*. Cambridge: MIT Press.
- [36] Siegel, D. (1979). *Topics in English Morphology*. New York: Garland.
- [37] Smith, N. (2004) *Chomsky: Ideas and Ideals*. Second edition. New York: Cambridge University Press.
- [38] Sugimoto, Y. (2019). An exoskeletal model and MERGE: On functional categories and wh-movement in Cape Verdean creole. Ms. University of Michigan.
- [39] Travis, L. (1994). Event phrase and a theory of functional categories. In P. Koskinen (Ed.), *Proceedings of the 1994 Annual Conference of the Canadian Linguistic Association* (pp. 559-570). Toronto: Toronto Working Papers in Linguistics.
- [40] Travis, L. (2000). Event structure in syntax. In C. Tenny & J. Pustejovsky (Eds.), *Events as Grammatical Objects* (pp. 145-185). Stanford, CA: CSLI Publications.
- [41] Wen, Binli. (2002). *An introduction to syntax*. Beijing: Foreign Language Teaching and Research Press.
- [42] Williams, E. (1980). Predication. *Linguistic Inquiry*, 11(1), 203-238.
- [43] Wu, Gang. (2006). *A Study on Generative Grammar*. Shanghai: Shanghai Foreign Language Education Press.
- [44] Xu, Liejiong. (2009). *Theories of Generative Grammar: from Standard Theory to Minimalism*. Shanghai: Shanghai Education Press.

Haojie Li is the corresponding author of this paper, who was born in Shandong, China. He received his Ph.D. degree at Guangdong University of Foreign Studies, China. He is currently a lecturer at the School of Foreign Languages, Southwest University of Political Science and Law, Chongqing, China. His research interests include syntax and theoretical linguistics. He has published a number of papers in his areas of expertise, which have appeared in scholarly publications in China and Europe.

Tongde Zhang was born in Shandong, China. He received his Ph.D. degree at Guangdong University of Foreign Studies, China. He is currently a lecturer at the Department of English Education, East China University of Technology, Fuzhou, Jiangxi, China. His research interests include cognitive poetics, comparative cultural studies, foreign literature theory and methodology. He has published a number of papers both at home and abroad.