A Study of Two Chinese Translations of "Syntactic Structures"

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Abstract. In this report, we describe our results of carefully studying the first chapter of two published Chinese translations of Noam Chomsky's Syntactic Structures, as translated by Wang and Lu (1966) and Xing et al. (1979). Our first step was to create a word-by-word alignment, in as much as that was possible. We then examined ways we could use the alignment to generate other resources, such as a dictionary and a procedure for automating the translation process. We then retranslated the text, using the rules we developed. We will present this set of rules and the resulting translation in the body of this report. The appendix contains the published Chinese texts that we worked from, the alignments of these texts, and the small dictionary we produced.

Keywords: English-Chinese Translation

1. Introduction

In this report, we describe our results of carefully studying the first chapter of two published Chinese translations of Noam Chomsky's Syntactic Structures, as translated by Wang and Lu (1966) and Xing et al. (1979). Our first step was to create a word-by-word alignment, in as much as that was possible. We then examined ways we could use the alignment to generate other resources, such as a dictionary and a procedure for automating the translation process. We then retranslated the text, using the rules we developed. We will present this set of rules and the resulting translation in the body of this report. The appendix contains the published Chinese texts that we worked from, the alignments of these texts, and the small dictionary we produced. We should mention that although we were interested in fully automating our results in a working MT system, we performed this study by hand due to time constraints.

For the rule system, we developed a minimal interlingual representation to help us focus on critical grammatical differences and similarities between Chinese and English. This minimal representation encodes basic relations encoded by functional heads. [1] Most of the rules we developed are triggered by features of functional heads, such as complementizers, inflections, and determiners.

The original text of the first chapter of *Syntactic Structures*, as well as our translation based on the set of rules we developed, is shown in Figure 1.

We will show in detail how the first sentence is translated. After this, we will explain how the rules work. Let us start by looking at the major constituents of the first sentence, shown in (1).

INPUT (1)

```
[Syntax is
        [the study of
           [[the principles and processes]
            [by which sentences are constructed
                                    [in particular languages]]]]]
```

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[1] Syntax is the study of the principles and processes by which sentences are constructed in particular languages. [2] Syntactic investigation of a given language has as its goal the construction of a grammar that can be viewed as a device of some sort for producing the sentences of the language under analysis. [3] More generally, linguists must be concerned with the problem of determining the fundamental underlying properties of successful grammars. [4] The ultimate outcome of these investigations should be a theory of linguistic structure in which the descriptive devices utilized in particular grammars are presented and studied abstractly, with no specific reference to particular languages. [5] One function of this theory is to provide a general method for selecting a grammar for each language, given a corpus of sentences of this language. [6] The central notion in linguistic theory is that of "linguistic level." [7] A linguistic level, such as phonemics, morphology, phrase structure, is essentially a set of descriptive devices that are made available for the construction of grammars; it constitutes a certain method for representing utterances. [8] We can determine the adequacy of a linguistic theory by developing rigorously and precisely the form of grammar corresponding to the set of levels contained within this theory, and then investigating the possibility of constructing simple and revealing grammars of this form for natural languages. [9] We shall study several different conceptions of linguistic structure in this manner, considering a succession of linguistic levels of increasing complexity which correspond to more and more powerful modes of grammatical description; and we shall attempt to show that linguistic theory must contain at least these levels if it is to provide, in particular, a satisfactory grammar of English. [10] Finally, we shall suggest that this purely formal investigation of the structure of language has certain interesting implications for semantic studies. [11] The motivation for the particular orientation of the research reported here is discussed below in section 6.

[1] 造句法是在具體語言中我們所構造句子的原則和方法的研究. [2]一給與語言的句法研究以語法的建造當做目的,這語法可被看成某些為了產生在分析之下語言的句子種類的方法. [3] 更一般性地,語言學家們必須關心如何確定成功的語法的很基本的問題. [4]這些研究的最後的結論應該是在語言結構的理論中被應用在具體語法中並抽象地被表現和研究的描寫方法,但沒有提到特定的具體語言. [5]這理論的功用之一是對於每一語言(給與這語言的句子的語群)提供一個選擇一個語法的一般性的辦法. [6] 語言理論的中心的概念是語言平面. [7]一語言平面,諸如音位學,構詞學,詞組結構. 本質上是一套為了語法的建造被製造成可用的描寫方法;它對於表達說法建立某種辦法. [8]我們可以決定一個語言理論的建全性以嚴格地和確實地發展合乎包含在這理論內的一套平面的語法的形式. 然後為了自然語言研究如何建造簡單的與明瞭的這形式的語法的可能性. [9] 我們將用這方式研究幾種不同的語言結構的觀念,考慮相對應於越發有效力的語法描寫的形式的一系列複雜性漸增的語言平面;並且我們將嘗試展示語言理論至少必須包含這些平面,特別是如果它提供一個滿意英語的語法. [10]最後,我們將提出語言的結構的這種純粹地形式上的研究對於語意的研究有一定的有趣的提示.[11] 在這裡報告的研究的具體方向的動機在後面第六章被討論.

Figure 1. Chapter One of *Syntactic Structures* and Our Translation

First, the function words are translated into a functional interlingua that corresponds to the source input. The nodes in capital letters in (2) encode functional elements. The DET is the determiner node, BE is the copula, and COMP is the complementizer. We are also treating the prepositions as functional elements for this particular study because it simplifies the presentation of our rules. Indices are encoded in square brackets.

FUNCTIONAL INTERLINGUA (2)

```
[Syntax BE[1]                                      DET[1]:{definite}
  [DET[1] study -GEN                               DET[2]:{definite,plural}
     [[DET[2] principle and process]               DET[3]:{bare,plural}
      [COMP DET[3] sentence                        DET[4]:{bare,plural}
           BE[2] constructed                        BE[1]:{singular}
           [IN DET[4] particular language]]]]]      BE[2]:{plural}
                                                     COMP:{+wh,P=by}
```

Thus in (2), DET[1] is marked as definite. The determiner node DET[3] and DET[4] are used to encode plurality, even though no determiner is present in the source text. We use this notation to indicate that the plurality features are stripped from the host nouns in the source language, and would be saved on the DET node in an implemented system. This is reflected in the substitution of principle for principles, for example. The fact that these determiners do not appear in the source sentences is encoded by the feature bare. In translating from Chinese to English, features for these nodes would presumably need to be recovered from the discourse in order to be instantiated on the corresponding English nodes. The feature notation for the functional elements will be omited from the following figures since it is largely irrelevant for our treatment.

Now rules which are triggered by the functional elements apply. First consider the application of the rule of Locative Preposing. This rule will be discussed in more detail below. In (3), the rule preposes the locative PP [IN DET particular language] to the position shown below.

LOC – PREPOSING (3)

```
[Syntax BE
 [IN DET particular language]
 [DET study -GEN
    [[DET principle and process]
     [COMP DET sentence BE constructed]]]]
```

The English word *of* is a kind of inverse genitive marker, being encoded as -GEN above. This node needs to be translated to the "real" genitive, since Chinese does not have an inverse genitive. Thus a rule needs to substitute the preposition and swap the NP's. This rule is -GEN to GEN, and is shown in (4).

–GEN to GEN (4)

```
[Syntax BE
  [IN DET particular language]
  [DET [[DET principle and process]
        [COMP DET sentence BE constructed]]
        GEN study]]
```

In order to get a close translation of a passive sentence inside a relative clause, it is often necessary to turn the passive clause into an active clause. Thus in this case, the rule Passive to Active applies in (5).

PASSIVE TO ACTIVE (5)

```
[Syntax BE
  [IN DET particular language]
  [DET [[DET principle and process]
        [COMP we construct DET sentence]]
        GEN study]]
```

Notice that the rule has added a default subject `we` to the relative clause.

In English, relative clauses follow the nouns they modify. In Chinese, they precede them. Thus we have several rules that re-arrange relative clauses. The particular rule that yields the correct word order below is the `BY-COMP` rule.

BY − COMP (6)

```
[Syntax BE
  [IN DET particular language]
  [DET [[we BY construct DET sentence COMP]
        [DET principle and process]]
        GEN study]]
```

What makes the `BY-COMP` rule special is that it introduces the functional element `BY` in the relative clause. This is a particle (所 – *suo*) that is required to translate the English `by` phrase.

Next the system plugs in the functional lexical elements by the rule `F-LEX`.

F − LEX (7)

```
[Syntax 是
  [在 particular language 中]
  [[[we 所 construct sentence 的]
        [principle and process]]
        的 study]]
```

It should be clear from this example why we wish to have an interlingual system for the functional elements: notice that both COMP and GEN are encoded by the same Chinese word 的 (*de*). A simple transfer system would have to keep track of which 的 (*de*) is being used. Thus a conceptual basis for the interlingua is the ability to handle word sense ambiguity.

Next the system plugs in the open class lexical elements by the rule `LEX`.

LEX (8)

```
[造句法 是
  [在 具體 語言 中]
  [[[ 我們 所 構造 句子 的]
        [原則 和 方法]]
        的 研究]]
```

This is now the final output of the translation process.

RULE	Number of applications	Applies in Sentence:
Translating COMP		
THAT-WHICH-COMP	7	2,4,7,8,8,9,11
FOR-COMP	6	2,5,7,7,8,10
HIDDEN-COMP	3	4,8,11
OF-GERUND-COMP	2	3,8
GERUND-COMP	1	8
IN-COMP	1	4
BY-COMP	1	1
Translating INFL		
PASSIVE-TO-ACTIVE	1	1
Prepositions		
LOC-PREPOSING	4	1,4,6,11
Other Rules		
HEAVY-NP-SHIFT	1	2
F-LEX	(Applies to each functional element.)	
LEX	(Applies to each open-class word.)	

Figure 2. Rules Used in Translating Chapter 1 of *Syntactic Structures*

2. The Rules For Translating English to Chinese

Most of the rules deal with translating relative clauses. These rules are triggered by features of COMP. In some cases, passives in relative clauses must be made active before the appropriate COMP rule can apply. We leave it as an open question whether the rules should be ordered or whether filters should cause the system to backtrack and apply rules when the output fails to meet certain conditions. For example, in our treatment, the output of the `PASSIVE-TO-ACTIVE` rule must feed the `COMP` rules. We grouped the Locative Preposing rule with the rules triggered by functional heads above for ease in presentation, but nothing we have dealt with here mitigates that as a design decision. The rule of `HEAVY-NP-SHIFT` reverses the effect of rightward-shifted NP's in English. Chinese appears not to have heavy NP shift, so every instance of a shifted NP in English must be put back in its source position. Figure 2 illustrates the rules, how many times they applied, and which sentences they applied in.

In the next section, we will give the formal descriptions of the rules we used to translate the first chapter of *Syntactic Structures* into Chinese. First we will describe the rules that deal with complementizers and relative clauses. Then we will discuss the INFL rule that changes passive to active. Last, we will discuss the prepositional rules and the heavy NP shift rule. In the appendix, we will show the domains of the rule applications where they apply in the original English text.

2.1. Translating COMP

The most important features of English relative clauses is that (i) they follow the noun they modify and (ii) the complementizer is the first element of the relative clause. Chinese relative clauses are the mirror image of English: (i) the relative clause precedes the noun it modifies and (ii) the complementizer is the last element of the clause. Translating relative clauses, therefore, involves permuting these elements accordingly. The following rules do that, in addition to making other adjustments necessary for smooth translations.

Consider the `THAT-WHICH-COMP` rule, listed in (9) below.

Definition of THAT − WHICH − COMP (9)

```
[NP [COMP [..A..]]]  ==>
[[[..A..] COMP] NP]
```

The left hand side of an arrow indicates that the structure of English sentence, which is the input. The right hand side of an arrow shows the structure of Chinese sentence, which is the output. The rule can be applied only when the structure of input matches the left hand side of the rule. The application of the rule is illustrated below in (10).

Application of THAT − WHICH − COMP (10)

```
Input:
       This computer is [the tool [(that/which) [can do calculation]]].  ==>

Output:
       This computer is [[ can do calculation COMP] DET tool ]
       這     電腦     是    能  做    計算       的       工具 .
       zhe dian nao  shi  neng zuo  jisuan     de       gongju
```

Note of course that the DET node in the interlingua is spelled out as zero in the Chinese output.

In general we use this arrow ==> to define translation rules. In some of the rules below, we also use the --> arrow to define paraphrase rules that operate within a language.

The next rule – BY-COMP – does more than permute the NP and relative clause and move COMP; it also introduces a particle 所 (*suo*) that corresponds roughly to English *by* in this case.

Definition of BY − COMP (11)

```
[NP [BY COMP [SUBJECT [..A..]]]]  ==>
[[SUBJECT 所\SUO [..A..] COMP] NP]
```

It is otherwise just like the THAT-WHICH-COMP rule, as we see below.

Application of BY − COMP (12)

```
Input:
       This is [the algorithm [by which [we calculate pi]]].  ==>

Output:
       This is [[ we 所\SUO calculate pi      COMP] algorithm]
       這    是  我們  所     計算       圓周率     的     演算法 .
       zhe  shi women suo   jisuan   yanzhoulu de    yian suan fa
```

The HIDDEN-COMP rule translates an English relative clause that lacks a complementizer. It accomplishes this by first introducing a complementizer into the functional interlingua, as indicated in Step 1. Then Step 2 translates the result of Step 1 which now has a complementizer in the interlingua. Thus we have encoded the effects of paraphrasing inside the structure of the rule definition itself. The paraphrase rules, which apply before translation rules, are indicated with the --> arrow.

Definition of HIDDEN − COMP (13)

```
Step 1: [NP [V.particple [..A..] by SUBJECT]]   -->
Step 2: [NP [COMP [INFL V.particple [..A..]]]]  -->  where INFL:{passive}
Step 3: [NP [COMP [INFL SUBJECT V [..A..]]]]    ==>  change: INFL:{active}
        [[SUBJECT 所\SUO [..A..] COMP] NP]
```

Notice that `Step 3` is very similar to the `THAT-WHICH-COMP` rule. In a more complete treatment, we would separate the paraphrases from the rule definitions and allow the paraphrase rules to feed the entire set of translation rules. Nonetheless, for the purpose of this study, we are conflating the paraphrase rules into the definition of the translation rules. The effect of the `HIDDEN-COMP` rule is shown in (14). Notice in particular that the passive in the relative clause is made active. Also, the rule as stated requires an oblique subject in a `by` phrase in order to work. A more general rule would also handle passives without oblique subjects.

Application of `HIDDEN − COMP` (14)

```
Input:
(i)     This is the descriptive devices (utilized) by linguists.        -->

(ii)    This is the descriptive device [COMP INFL utilize by linguists]  -->

(iii)   This is the descriptive device [COMP INFL linguists utilize]     ==>

Output:
        This is [[linguists  所\SUO  utilize  COMP] DET descriptive device]
        這   是   語言學家們       所      使用      的       描寫        方法 .
        zhe  shi yuyanxuejiamen  SUO   shiyong   de     miaoxie     fangfa
```

In the above example, sentence (i) is input. We rewrite it into sentence (ii) and rewrite (ii) into (iii) and translate from (iii) into Chinese. Notice that we can always transform a sentence with a hidden complementizer into a sentence with a complementizer and passive structure as we see from sentences (i) and (ii). Then we apply the rule `PASSIVE-TO-ACTIVE`. Now the INFL node inside of [..A..] becomes active and absorbs the features associated with the past particple of the verb `utilized`, leaving the verb as `utilize`. Then we apply rule `THAT-WHICH-COMP` on sentence (iii) and have the output shown above.

Next let us consider the rule that translates gerundive relative clauses.

Definition of `GERUND − COMP` (15)

```
[NP [V-ing [..A..]]]    -->
[NP [COMP  V [..A..]]] ==>
[[V [..A..] COMP] NP]
```

The effect of `GERUND-COMP` is shown below.

Application of `GERUND − COMP` (16)

```
Input:
(i)     This is the answer (corresponding to) the question     -->

(ii)    This is the answer [COMP corresponds to the question]  ==>

Output:
        This is [[corresponds to DET [question] COMP] DET answer]
        這   是       相對應於                問題     的        答案 .
        zhe  shi  xiang dui ying yu      wenti   de        da an
```

Sentence (i) is input. We rewrite it into sentence (ii) and translate from (ii) to Chinese.

We notice that the structure of sentence (ii) is exactly the same as the input of rule `THAT-WHICH-COMP`. Actually, any sentence which contains a gerund functioning as a relative pronoun could in principle be transformed into a sentence with an overt complementizer such as *that* or *which*. That is, in a more complete treatment, we would directly feed the rule `THAT-WHICH-COMP` instead of encoding its effects locally on the rule `GERUND-COMP`.

We will now present three more rules for translating relative clauses: `IN-COMP`, `OF-GERUND-COMP`, and `FOR-COMP`. These rules follow the same format as above. The rules will be presented with a few comments on their use below.

Definition of `IN − COMP` (17)

```
[NP [IN COMP [SUBJECT [..A..]]]]  ==>
[[SUBJECT 所\SUO [..A..] COMP] NP]
```

Application of `IN − COMP` (18)

```
Input:
       This is [the place [in which [I live]]].  ==>

Output:
       This is [[I 所\SUO live COMP] DET place
       這   是  我  所    住     的       地方 .
       zhe  shi wo  suo   zhu    de       difang
```

Definition of `OF − GERUND − COMP` (19)

```
[NP [of [V-ing]] [..A..]]       -->
[NP [of [how  V]] [..A..]]     ==>
[[[[how\如何\pin-yin  V][..A..]] GEN] NP]
```

Application of `OF − GERUND − COMP` (20)

```
Input:

I consider [the problem [of [selecting]] the courses of
Computer Science Department].                              ==>

Output:

I consider [[[[how select Computer Science Department] GEN  DET course]
我  考慮      如何  選擇    電腦      科學      系       的       課程
wo  kaolu     ruhe xuanze dianlao   kexue     xi       de       kecheng

GEN] DET problem]
的        問題 .
de        wenti
```

Note that there is an understood subject of the verb V, which is coreferent with the closest overt subject.

Definition of `FOR − COMP` (21)

```
[=S SUBJECT [..A..] [for [V-ing ..B..]] S=]  ==>
[=S SUBJECT [對於\dweiyu [V ..B..]] [..A..] S=]
```

In some cases, we use 為了 *weile* instead of 對於 *dweiyu* because the sentence is smoother, but we will not investigate that here.

Application of `FOR − COMP` (22)

```
Input:
        [It [constitutes a certain method] [for [representing utterances]]].
                                                                          ==>
Output:
        [It [for [represent DET utterance]][constitute DET certain method]]
        它  對於    表達          說法         建立          某種       辦法  .
        ta  duiyu  biaoda   0   shuofa      jianli       mouzhong  banfa
```

2.2. Multiple Application of COMP Rules

So far, the architecture of our rules is quite simple, since paraphrase rules have been built into the translation rules in some cases. Consequently, each rule only needs to apply once. However, we know that this simple architecture cannot perform adequately in the general case. In particular, if a sentence has more than one relative clause, the `COMP` rules must apply as many times as there are complementizers. Consider the sentence in (23), which contains two relative clauses.

Multiple Relative Clauses (23)

```
            NP1        COMP1                NP2       COMP2
This is [the answer (corresponding) to [the question (contained)
within this chapter]].
```

In this case, two rules must apply to translate the sentence – `GERUND-COMP` and `HIDDEN-COMP`. These steps are shown below.

Application of `GERUND − COMP` (24)

```
Input:
                    NP1        COMP1                NP2       COMP2
        This is [the answer (corresponding) to [the question (contained)
        within this chapter]].                                        ==>

Output:
    This is [corresponds to
    這   是    合乎
    zhe  shi   hehu

        [DET question (contained) [within this chapter]]

                                COMP1 DET answer]
                                 的        答案
                                 de        da an
```

Now the `HIDDEN-COMP` rule applies.

Application of `HIDDEN − COMP` (25)

```
This is [corresponds to
這   是    合乎
zhe  shi   hehu

        [contain [within this chapter] COMP2 DET question]
          包含        在這章內        的          問題
         baohan   zai zhe zhang nei    de          wenti

                                        COMP1 DET answer]
                                         的         答案
                                         de        da an
```

2.3. Translating INFL

The following rule transforms a passive sentence into an active one.

Definition of `PASSIVE − TO − ACTIVE` (26)

```
[=S OBJECT INFL VERB S=]  ==>           (where INFL:{passive})
[=S somebody INFL VERB OBJECT S=]       (change INFL:{active})
```

Notice that there is no oblique subject in the input. However, it still can be translated in an active way in Chinese by adding a default subject. We will see below that default subjects are sometimes necessary in order to produce a smooth translation of an English passive into a Chinese active sentence. In the rule above, we have encoded the default subject as simply `somebody`. Obviously, the rule must be more sophisticated in the general case.

Application of `PASSIVE − TO − ACTIVE` (27)

```
Input:
        John   INFL saw  ==>
        約翰    BEI  看見
        yuehan BEI kanjien

Output:
        Somebody   saw     John.
          某人       看見     約翰  .
        mouren    kanjien  yuehan
```

As before, we encode that passive voice with the `INFL` marker.

2.4. Prepositional Phrases

In Chinese, the locative phrase must go in post-subject position, as the following rule `LOC-PREPOSING` shows:

Definition of `LOC − PREPOSING` (28)

```
[=S SUBJECT [..A..] [in NP] [..B..] S=]  ==>
[=S SUBJECT [在\zai NP 中\zhong] [..A..] [..B..] S=]
```

Application of `LOC − PREPOSING` (29)

```
Input:
        I walked in the park.  ==>

Output:
        I   [in  the  park]         walk
        我  [在       公園    中]    散步  .
        wo  zai      gongyuan zhong   sanbu
```

2.5. Heavy NP Shift

Definition of `HEAVY − NP − SHIFT` (30)

```
      [=S [..A..] has as its goal [..B..] S=]  -->
      [=S [..A..] has [..B..] as   its goal S=]
                  以          當做
```

Application of `HEAVY − NP − SHIFT` (31)

```
Input:
        [Syntactic investigation of a given language]
        has as its goal
        [the construction of a grammar that can be viewed as a device of
        some sort for producing the sentences of the language under
        analysis].                                                     -->
Output:

        [Syntactic investigation of a given language]
        has
        [the construction of a grammar that can be viewed as a device of
        some sort for producing the sentences of the language under
        analysis]
        as its goal.
```

This example structure is special, since there is a different translation for `has`. Instead of the usual translation, *you*, we translate it as 以 *yi* in combination with the translation of English *as* – 當做 *dang zuo*.

3. General Remarks for Future Work

A general question that must be properly addressed is the architecture that governs rule application. In particular, boundaries should be clearly drawn between the source and target languages on the one hand and the interlingua on the other hand. Also, the degree to which the rules we have defined are reversible should be investigated.

Another area that needs investigation is the tension between competence and performance in treating the output of the rule system. In particular, if the `COMP` rules apply to an NP modified by several relative clauses, the result will be a structure that is grammatical but too difficult to process. Recall that relative clauses go to the right of the noun in English, but to the left in Chinese. So translating a clause with multiple relative clauses in English would involve piling up the translations of these clauses to the left of the noun in Chinese. The problem is that these sentences are often difficult to understand. This problem could in principle be handled by breaking the sentence up into smaller sentences in which former relative clauses are matrix sentences and the modifications are encoded by "normal" pronouns instead of relative pronouns. However, for this solution to work, we would have to have a measurement of processing difficulty. A general solution was not obvious to us, since in some cases, two or more prenominal relative clauses were not difficult to process, and in other cases they were.

A related issue that would require investigation if relative clauses are parcelled off into separate sentences is the question of intersentential anaphora. The English counterparts encode the dependencies that go along with relative clauses locally with a relative pronoun. These local dependencies would have to be recovered globally with a discourse anaphora component for the Chinese counterparts.

4. Appendix

4.1. English Text of Syntactic Structures, Chapter 1, Introduction

1 Syntax is the study of the principles and processes by which sentences are constructed in particular languages.

2 Syntactic investigation of a given language has as its goal the construction of a grammar that can be viewed as a device of some sort for producing the sentences of the language under analysis.

3 More generally, linguists must be concerned with the problem of determining the fundamental underlying properties of successful grammars.

4 The ultimate outcome of these investigations should be a theory of linguistic structure in which the descriptive devices utilized in particular grammars are presented and studied abstractly, with no specific reference to particular languages.

5 One function of this theory is to provide a general method for selecting a grammar for each language, given a corpus of sentences of this language.

6 The central notion in linguistic theory is that of "linguistic level."

7 A linguistic level, such as phonemics, morphology, phrase structure, is essentially a set of descriptive devices that are made available for the construction of grammars; it constitutes a certain method for representing utterances.

8 We can determine the adequacy of a linguistic theory by developing rigorously and precisely the form of grammar corresponding to the set of levels contained within this theory, and then investigating the possibility of constructing simple and revealing grammars of this form for natural languages.

9 We shall study several different conceptions of linguistic structure in this manner, considering a succession of linguistic levels of increasing complexity which correspond to more and more powerful modes of grammatical description; and we shall attempt to show that linguistic theory must contain at least these levels if it is to provide, in particular, a satisfactory grammar of English.

10 Finally, we shall suggest that this purely formal investigation of the structure of language has certain interesting implications for semantic studies.

11 The motivation for the particular orientation of the research reported here is discussed below in section 6.

4.2. Our translation of Syntactic Structures, Chapter 1.

The following is the Chinese sentences translated by using rules that we developed. These Chinese sentences are translation of Syntactic Structures, Chapter 1.

1 造句法是在具體語言中我們所構造句子的原則和方法的研究.

2 一給與語言的句法研究以語法的建造當做目的, 這語法可被看成某些 為了產生在分析之下語言的句子種類的方法.

3 更一般性地, 語言學家們必須關心如何確定成功的語法的很基本的問題.

4 這些研究的最後的結論應該是在語言結構的理論中被應用在具體語法中並抽象地 被表現和研究的描寫方法, 但沒有提到特定的具體語言.

5 這理論的功用之一是對於每一語言(給與這語言的句子的語群)提供一個選擇 一個語法的一般性的辦法.

6 語言理論的中心的概念是語言平面.

7 一語言平面, 諸如音位學, 構詞學, 詞組結構. 本質上是一套為了語法的建造 被製造成可用的描寫方法 ; 它對於表達說法建立某種辦法.

8 我們可以決定一個語言理論的建全性以嚴格地和確實地發展合乎包含在這理論內 的一套平面的語法的形式. 然後為了自然語言研究如何建造簡單的與明瞭的這 形式的語法的可能性.

9 我們將用這方式研究幾種不同的語言結構的觀念, 考慮相對應於越發有效力的 語法描寫的形式的一系列複雜性漸增的語言平面 ; 並且我們將嘗試展示語言理論 至少必須包含這些平面, 特別是如果它提供一個滿意英語的語法.

10 最後, 我們將提出語言的結構的這種純粹地形式上的研究對於語意的研究有一定的 有趣的提示.

11 在這裡報告的研究的具體方向的動機在後面第六章被討論.

4.3. Hand Parse of English Text of Syntactic Structures, Chapter 1

We will now present our hand parse of the English text, annotated with the domains of the rules which apply to render the Chinese translation. The first line for each translated sentence is the English original. The second portion indicates the rule domains, and the final line is the Chinese translation.

```
1 Syntax is the study of the principles and processes
   by which sentences are constructed in  particular languages.

   Syntax is
     [=BY-COMP
       [=GEN the study -GEN the principles and processes GEN=]
       by which
       [=PASSIVE-TO-ACTIVE sentences are constructed PASSIVE-TO-ACTIVE=]
       [=LOC-PREPOSING in particular languages LOC-PREPOSING=]
      BY-COMP=].
```

造句法是在具體語言中我們所構造句子的原則和方法的研究 .

```
2 Syntactic investigation of a given language has as its goal the
   construction of a grammar that can be viewed as a device of
   some sort for producing the sentences of the language under
   analysis.

   [=HEAVY-NP-SHIFT
     [=GEN Syntactic investigation -GEN a given language GEN=]
     has as its goal
     [=FOR-COMP
       [=THAT-WHICH-COMP
         [=GEN the construction -GEN a grammar GEN=]
         that can be viewed as
         [=GEN a device -GEN some sort GEN=]
       THAT-WHICH-COMP=]
       for producing
         [=GEN the sentences -GEN the language GEN=]
       under analysis
     FOR-COMP=]
   HEAVY-NP-SHIFT=].
```

一給與語言的句法研究以語法的建造當做目的,這語法可被看成某些
為了產生在分析之下語言的句子種類的方法.

3 More generally, linguists must be concerned with the problem of determining the fundamental underlying properties of successful grammars.

```
More generally, linguists must be concerned with
[=OF-GERUND-COMP
  [=GEN
    the problem
    -GEN
    determining
    [=GEN
      the fundamental underlying properties
      -GEN
      successful grammars
    GEN=]
  GEN=]
OF-GERUND-COMP=].
```

更一般性地,語言學家們必須關心如何確定成功的語法的很基本的問題.

4 The ultimate outcome of these investigations should be a theory of linguistic structure in which the descriptive devices utilized in particular grammars are presented and studied abstractly, with no specific reference to particular languages.

```
[=GEN The ultimate outcome -GEN these investigations GEN=]
should be
[=IN-COMP
  [=GEN a theory -GEN linguistic structure GEN=]
  in which
  [=HIDDEN-COMP
    the descriptive devices utilized
    [=LOC-PREPOSING in particular grammars LOC-PREPOSING=]
  HIDDEN-COMP=]
  are presented and studied abstractly
IN-COMP=],
with no specific reference to particular languages.
```

這些研究的最後的結論應該是在語言結構的理論中被應用在具體語法中並抽象地被表現和研究的描寫方法. 但沒有提到特定的具體語言.

5 One function of this theory is to provide a general method for selecting a grammar for each language, given a corpus of sentences of this language.

```
[=GEN One function -GEN this theory GEN=]
is to
[=FOR-COMP
  provide a general method for selecting a grammar for each language
FOR-COMP=],
given
[=GEN
  a corpus
  -GEN
  [=GEN
    sentences
    -GEN
    this language
  GEN=]
GEN=]
```

這理論的功用之一是對於每一語言(給與這語言的句子的語群)提供一個選擇一個語法的一般性的辦法.

6 The central notion in linguistic theory is that of "linguistic level."

```
The central notion
  [=LOC-PREPOSING in linguistic theory LOC-PREPOSING=]
  is
  [=GEN that -GEN "linguistic level" GEN=].
```

語言理論的中心的概念是語言平面.

7 A linguistic level, such as phonemics, morphology, phrase structure, is essentially a set of descriptive devices that are made available for the construction of grammars; it constitutes a certain method for representing utterances.

```
[=FOR-COMP
  A linguistic level, such as phonemics, morphology, phrase
  structure, is essentially
  [=THAT-WHICH-COMP
    [=GEN a set -GEN descriptive devices GEN=]
    that are made available
  THAT-WHICH-COMP=]
  for [=GEN the construction -GEN grammars GEN=]
FOR-COMP=];
[FOR-COMP
  it constitutes a certain method for representing utterances
FOR-COMP=].
```

一語言平面, 諸如音位學, 構詞學, 詞組結構. 本質上是一套為了語法的建造被製造成可用的描寫方法 ; 它對於表達說法建立某種辦法.

```
8 We can determine the adequacy of a linguistic theory by
   developing rigorously and precisely the form of grammar
   corresponding to the set of levels contained within this
   theory, and then investigating the possibility of
   constructing simple and revealing grammars of this form for
   natural languages.

   We can determine
   [=GEN the adequacy -GEN a linguistic theory GEN=]
   by developing rigorously and precisely
   [=HIDDEN-COMP
     [=GERUND-COMP
       [=GEN the form -GEN grammar GEN=]
       corresponding to
       [=GEN the set -GEN levels GEN=]
       contained within this theory
     GERUND-COMP=]
   HIDDEN-COMP=],
   and then
   [=FOR-COMP investigating
     [=OF-GERUND-COMP
       [=GEN the possibility
         -GEN
         constructing
         [=GEN simple and revealing grammars -GEN this form GEN=]
       GEN=]
     OF-GERUND-COMP=]
     for natural languages
   FOR-COMP=].
```

我們可以決定一個語言理論的建全性以嚴格地和確實地發展合乎包含在這理論內的一套平面的語法的形式. 然後為了自然語言研究如何建造簡單的與明瞭的這形式的語法的可能性.

9 We shall study several different conceptions of linguistic structure in this manner, considering a succession of linguistic levels of increasing complexity which correspond to more and more powerful modes of grammatical description; and we shall attempt to show that linguistic theory must contain at least these levels if it is to provide, in particular, a satisfactory grammar of English.

```
We shall study
[=GEN several different conceptions -GEN linguistic structure GEN=]
in this manner, considering
[=THAT-WHICH-COMP
   [=GEN
     a succession
     -GEN
     [=GEN linguistic levels -GEN increasing complexity GEN=]
   GEN=]
   which correspond to
   [=GEN more and more powerful modes -GEN grammatical description GEN=]
THAT-WHICH-COMP=];
and we shall attempt to show that linguistic theory must contain
at least these levels if it is to provide, in particular,
[=GEN a satisfactory grammar -GEN English GEN=]
```

我們將用這方式研究幾種不同的語言結構的觀念，考慮相對應於越發有效力的語法描寫的形式的一系列複雜性漸增的語言平面 ；並且我們將嘗試展示語言理論至少必須包含這些平面，特別是如果它提供一個滿意英語的語法.

10 Finally, we shall suggest that this purely formal investigation of the structure of language has certain interesting implications for semantic studies.

```
Finally, we shall suggest that
[=FOR-COMP
  [=GEN
    this purely formal investigation
    -GEN
    [=GEN the structure -GEN language GEN=]
  GEN=]
  has certain interesting implications for semantic studies
FOR-COMP=].
```

最後,我們將提出語言的結構的這種純粹地形式上的研究對於語意的研究有一定的有趣的提示.

11 The motivation for the particular orientation of the research reported here is discussed below in section 6.

```
[=HIDDEN-COMP
  [=GEN The motivation
    -GEN
    [=GEN the particular orientation -GEN the research GEN=]
  GEN=]
  reported here is discussed below
  [=LOC-PREPOSING in section 6 LOC-PREPOSING=]
HIDDEN-COMP=].
```

在這裡報告的研究的具體方向的動機在後面第六章被討論.

4.4. Wang and Lu 1966 translation of Syntactic Structures, Chapter 1.

Generally speaking, the Wang-Lu translation is not as close to the English original as the Xing translation, both in terms of syntax and in terms of the words chosen as translations. Moreover, sentence 12 below contains two errors. Whereas the original discusses an increasing complexity of *linguistic levels* , the translation says that what is increasing in complexity is the *conceptions of linguistic structure* (**觀念的語言結構**). Furthermore, the structure of this NP is not correct. The Wang and Lu Chinese translation is *linguistic structure* (**語言結構**) *of conceptions* (**觀念**), which is backwards from the English original *conceptions of linguistic structure.*

1 專門研究語言中句子構造的原理與程序的學問,我們稱之為造句法.

2 對某一種語言作造句上之研究時,其目的在編寫一部語法,根據這部語法,我們就可以知道怎樣產生該語言的句子.

3 因此,語言學家所一直注意的問題,就是要決定一部成功的語法所必須具備的一些基本性質.

4 這種研究的最後結論,應該是一套語言結構的理論.

5 這理論對於編寫語法時所用的寫實方法加以抽象式的敘述和研究,使其範圍不限於某些語言.

6 這套理論的功用之一,就是在觀察某種語言的語群後,我們就可以根據這理論,來供給該語言一個選擇語法的辦法.

7 語言理論的中心概念,就是語言層次.

8 所謂語言層次,諸如音位學,構詞學,詞組結構等.

9 就是編寫一套語法時可用的寫實方法,這些層次建立了一個表達語言的辦法.

10 在決定某種語言理論是否建全時,我們可先以嚴格確實的方式,建立一合乎這種理論所包含的語言層次的語法形式.

11 然後看是否可用這種語法形式為自然語言編寫一套簡單而明瞭的語法.

12 我們將用這種方式來研究幾種不同觀念的語言結構,由簡單進入複雜;

13 我們也想在本書中說明,如果要想編寫一套令人滿意的英語語法,其語言理論必須要包含這些語言層次.

14 最後我們想說明的是,這種對語言結構作純形式的研究,對語意的研究也有微妙的提示.

4.5. Xing et al 1979 translation of Syntactic Structures, Chapter 1

Generally speaking, the Xing translation is closer to the English original than the Wang-Lu translation, both in terms of syntax and in terms of the words chosen as translations. The translation as it appears here has been encoded in complex characters. The original was published using the simplified character set.

1 句法學是研究具體語言中構造句子所根據的原則和方法的學問.

2 研究某一種語言的句法,其目的在於編寫一部語法,這部語法可以看成用來產生被分析的這一語言的語句的某種手段(或者說"某種裝置").

3 更一般地說,語言學家必須關心的問題就是怎樣去確定那些成功的語法的基本性質.

4 這些研究的最後成果應該是一種關於語言結構的理論,它把應用在某些具體語法著作裡的描寫方法抽象地提出來加以研究,而所涉及的範圍卻並不限於某些具體語言.

5 這種理論的功用之一就是提供一個能夠為每一種語言(只要具備這一語言的語句素材)選擇出一部語法的方法.

6 語言理論的中心概念就是"語言平面"(或者稱為"語言層")的概念.

7 所謂"語言平面",如音位平面,詞法平面,詞組結構平面等.

8 從本質上說,就是一套用於編寫語法的描寫裝置.語言平面構成了某種表達話語的方法.

9 我們首先把合乎這一語言理論所包含的全套語言平面的語法形式嚴格而又精密地建立起來,然後再調查一下能不能用這種語法形式給自然語言編寫簡單明確的語法.

10 我們可以用這種辦法來確定一種語言理論是不是有缺點.

11 我們想用這個辦法來研究幾個有差別的語言結構概念,考慮一系列由簡單到複雜的,跟越來越有成效的語法描寫方式相對應的語言平面.

12 我們還想在這篇論文裡說清楚,要是想編寫一部令人滿意的(具體一點說)英語語法的話,其語言理論就必須至少包含這些語言平面.

13 最後我們想提一下:這種對語言結構的純形式的研究對於研究語意學也是能起一些有意思的啟示作用的.

14 這裡所說的決定研究工作的具體方向的動機問題,將在後面的$6中討論.

4.6. English Alignment of Wang and Lu, Chapter 1

```
==============================================================================
Wang-Lu Sentence 1 (corresponds to Chomsky Sentence 1)
==============================================================================
C          C->E-gloss               E'

專門       special-field            (A) special field
研究       study                    studies (the) knowledge
語言       language;linguistic      of[#] (the) principles
中         in                       and processes
句子       sentence                 of[1]
構造       structure                sentence
的[1]      GEN[1]                   structure;
原理       principle                we
與         and                      call
程序       process                  it
的[#]      NOM[#]                   syntax
學問       knowledge                .
,          ,
我們       we
稱         call
之         it
為         TO-BE
造句法     syntax
.
```

Wang-Lu Sentence 2 (corresponds to Chomsky sentence 2)

C	C->E-gloss	E’
對+[ ]	to;as to;with regard to;for(coverb)	To a certain kind
某+一+種	a certain kind	(of) language,when
語言	language;linguistic	(we) do (the) study
作	to do;to make	of[1] making sentences,
造句	to make a sentence	(its) goal is to edit
上	[ ]	a grammar. By this
之[1]	GEN[1]	grammar, we can know
研究	investigation;study;research	how (to) produce
時	when	sentences of[2]
,	,	language.
其	[pronoun]	
目的	goal	
在	is to(approx.)	
編寫	edit;compile	
一+部	(a;one) + CL	
語法	grammar	
,	,	
根據	by;in accordance with	
這+部	this	
語法	grammar	
,	,	
我們	we	
就	(coverb)	
可以	can;may	
知道	know	
怎樣	how	
產生	produce	
該	[ ]	
語言	language;linguistic	
的[2]	GEN[2]	
句子	sentence	
.	.	

```
================================================================================
Wang-Lu Sentence 3 (corresponds to Chomsky sentence 3)
================================================================================
C         C->E-gloss                      E'

因此      therefore;as a result           Therefore,(the) problem
,         ,                               that linguists always
語言學家  linguist                        pay attention (is to)
所        that                            determine some
一直      always;constantly               fundamental properties
注意      pay attention to                that a successful
的        that                            grammar must have.
問題      problem
,         ,
就是      that is
要        want;require
決定      determine
一+部     a + CL
成功的    successful
語法      grammar
所        that
必須      must
具備      have
的        that
一些      some
基本      fundamental
性質      property
.         .
```

==
Wang-Lu Sentence 4 (subpart of Chomsky sentence 4)
==

C	C->E-gloss	E'
這+種	this + kind	(An) ultimate outcome
研究	investigation;research;study	of[1] this kind investigation
的[1]	GEN[1]	should be a theory of[2]
最後	ultimate	linguistic structure.
結論	outcome	
,	,	
應該	should	
是	be(is,am,was,are,were)COPULA	
一+套	a + set	
語言	linguistic;language	
結構	structure	
的[2]	GEN[2]	
理論	theory	
.	.	

```
===============================================================================
Wang-Lu Sentence 5 (subpart of to Chomsky sentence 4)
===============================================================================
C         C->E-gloss                          E'

這         this                               (The) descriptive devices that
理論       theory                             (are) utilized for editing (a)
對+於      to;as to;with regard to;for(coverb) grammar.
編寫       edit;compile
語法       grammar                            With regard to (the) descriptive
時         when                               devices, this theory presents
所         that                               and studies it abstractly.
用         utilize
的         that                               **(The) descriptive devices
寫實       descriptive                        (are in) this theory.
方法       device
加以       [ ]
抽象式的    abstractly
敘述       present
和         and
研究       study                              make (the) scope (of)(this
,          ,                                  theory)(does) not limit (to)
使         to make                            some certain language.
其         [pronoun]
範圍       scope;range
不         not
限於       limit
某+些      some certain
語言       language;linguistic
.          .
```

Note: The translation of 此句不明顯 is not particularly obvious.

==
Wang-Lu Sentence 6 (corresponds to Chomsky Sentence 5)
==

C	C->E-gloss	E'
這+套	this + set	One function of[1] this theory
理論	theory	is (to) provide (a) method
的[1]	GEN[1]	(for) selecting (a) grammar
功用	function	(for) (a) language
之[2]	GEN[2]	in accordance with this
一	one	theory after observing (the)
,	,	corpus of[3]certain kind (of)
就是	that is	language.
在	after	
觀察	observe	
某+種	certain kind	
語言	language;linguistic	
的	GEN	
語群	corpus	
後		
,	,	
我們	we	
就	(coverb)	
可以	can;may	
根據	in accordance with;by(coverb)	
這	this	
理論	theory	
,	,	
來	aux. verb	
供給	provide	
該	[ ]	
語言	language;linguistic	
一+個	(a;one) + CL	
選擇	select	
語法	grammar	
的[%]	NOM[%]	
辦法	method	
.	.	

```
================================================================================
Wang-Lu Sentence 7 (corresponds to Chomsky sentence 6)
================================================================================
C         C->E-gloss                     E'

語言      linguistic                     A central notion
理論      theory                         of[1]
的[1]     GEN[1]                         linguistic theory
中心      central                        ,
概念      notion                         that is
,         ,                              linguistic
就是      that is                        level
語言      linguistic                     .
層次      level
.         .
```

```
================================================================================
Wang-Lu Sentence 8 (subpart of Chomsky sentence 7)
================================================================================
C         C->E-gloss               E'

所謂      so called
語言      linguistic;language      Linguistic level (includes)
層次      level                    phonemics level, morphology
,         ,                        level, phrase structure
諸如      such as                  level, etc.
音位學    phonemics
,         ,
構詞學    morphology
,         ,
詞組      phrase
結構      structure
等        etc.;and so on
.         .
```

```
==============================================================================
Wang-Lu Sentence 9 (subpart of Chomsky sentence 7)
==============================================================================
C         C->E-gloss               E'

就是      that is                  (The) descriptive devices
編寫      edit;compile             can (be) used (for) editing
一+套     a + set                  a grammar.
語法      grammar
時        when
可        can;may
用        use
的[#]     NOM[#]
寫實      descriptive
方法      device
,         ,
這+些     these                    these levels constitute
層次      level                    a method (for)
建立      constitute               representing language.
了        -le
一+個     a + CL
表達      represent
語言      language;linguistic
的[%]     NOM[%]
辦法      method
.         .
```

Wang-Lu Sentence 10 (subpart of Chomsky sentence 8)

C	C->E-gloss	E’
在	when	When (we) determine
決定	determine	whether (a) certain
某+種	certain + kind	kind (of) linguistic
語言	linguistic	theory is adequacy
理論	theory	or not ,
是否	whether or not	
建全	adequacy	
時	when	
,	,	
我們	we	we may first
可	can;may	construct (a)
先	first	form of grammar
以	by means of	corresponding to
嚴格	rigorously	(the) linguistic
確實	precisely	level that
的方式	by means of	this kind (of)
,		theory contains
建立	construct;constitute	by means of
一	a;one	rigorous and
合乎	correspond to	precise.
這+種	this + kind	
理論	theory	
所	that	
包含	contain	
的	that	
語言	linguistic	
層次	level	
的[&]	NOM[&]	
語法	grammar	
形式	form	
.	.	

```
================================================================================
Wang-Lu Sentence 11 (subpart of Chomsky sentence 8)
================================================================================
C         C->E-gloss                      E'

然後      then                            Then see if (we)
看        see                             can use this form
是否      whether or not                  (of) grammar to edit
可        can;may                         a set (of) simple and
用        use                             clear grammar for
這+種     this + kind                     natural language.
語法      grammar
形式      form
為        for the sake of;for(coverb)
自然      natural
語言      language;linguistic
編寫      edit;compile
一+套     a + set
簡單      simple
而        and
明瞭的    clear
語法      grammar
.         .
```

```
================================================================================
Wang-Lu Sentence 12 (subpart of Chomsky sentence 9)
================================================================================
C         C->E-gloss                       E'

我們      we                               From simple
將        shall                            to complex ,
用        in(prep.)                        we shall
這+種     this + kind                      study several
方式      manner                           different conceptions
來        aux. verb                        of[1] linguistic
研究      study;research;investigate       structure
幾種      several                          in this kind
不同      different                        (of) manner.
觀念      conception
的[1]     GEN[1]
語言      linguistic
結構      structure
,         ,
由        from(coverb)
簡單      simple
進入      to(coverb)
複雜      complex
;         ;
```

See section 4.4 for a discussion of the error in this translation.

==

Wang-Lu Sentence 13 (subpart of Chomsky sentence 9)

==

C	C->E-gloss	E'
我們	we	We also want (to) explain
也	also	(something) in this book.
想	want	
在	in	
本	this	
書	book	
中	in	
說明	explain	
,	,	
如果	if	If (we) want (to) edit a
要想	want;require	set (of) satisfactory
編寫	edit;compile	English grammar,
一+套	a + set	
令	to make	(then) (the) linguistic
人	human being;person	theory (of) English grammar
滿意的	satisfactory	must contain these
英語	English	linguistic levels.
語法	grammar	
,	,	
其	[pronoun]	
語言	linguistic;language	
理論	theory	
必須	must	
要	want;require	
包含	contain	
這些	these	
語言	linguistic	
層次	level	
.	.	

```
==============================================================================
Wang-Lu Sentence 14 (corresponds to Chomsky sentence 10)
==============================================================================
C          C->E-gloss                             E'

最後       finally                                Finally, we want (to)
我們       we                                     explain (that) this
想         want                                   kind (of) purely
說明       explain                                formal investigation
的[$]      NOM[$]                                 for natural language
是         be(is,am,was,are,were)COPULA           also has interesting
,          ,                                      implication for
這+種      this + kind                            semantic studies.
對+[ ]     for;(as to;to;with regard to)(coverb)
語言       language;linguistic
結構       structure
作         to do;to make
純         purely
形式的     formal
研究       investigation;research;study
,          ,
對+[ ]     for;(as to;to;with regard to)(coverb)
語意的     semantic
研究       study;research;investigation
也         also
有         has;have
微妙的     interesting
提示       implication
.          .
```

4.7. English Alignment of Xing et al, Chapter 1

```
==============================================================================
Xing Sentence 1 (corresponds to Chomsky sentence 1)
==============================================================================
C         C->E-gloss                    E'

句法學    syntax                        Syntax is (a) knowledge (for)
是        be(is,am,was,are,were)COPULA  studying sentences that (are)
研究      study                         constructed by (using) (the)
具體      particular                    principles and processes
語言      language                      in particular languages.
中        in
構造      construct
句子      sentence
所        that
根據      by(coverb)
的        that
原則      principle
和        and
方法      process
的[#]     NOM[#]
學問      knowledge
.
```

```
==============================================================================
Xing Sentence 2 (corresponds to Chomsky sentence 2)
==============================================================================
C          C->E-gloss                      E'

研究       investigation;study             (To) study (the) syntax of[1]
某+一+種   a certain kind                  a certain kind of language,
語言       language;linguistic             its goal (is to) edit a grammar.
的[1]      GEN[1]                          This grammar can be viewed as a
句法       syntax                          certain kind of[3] device (for)
,                                          producing sentences of[2] this
其         [pronoun]                       language which is analyzed.
目的       goal
在於       is to(approx.)
編寫       edit;compile
一+部      (a;one)+CL
語法       grammar
,
這+部      this+CL
語法       grammar
可以       can;may
看         be viewed
成         as(coverb)
用         utilize
來         aux. verb
產生       produce
被分析     be analyzed
的[@]      NOM[@]
這+一      this+one
語言       language;linguistic
的[2]      GEN[2]
語句       sentence
的[3]      GEN[3]
某種       a certain kind
手段       device
(
或者       or
說         say
某種       a certain kind
裝置       device
).
```

```
================================================================================
Xing Sentence 3 (corresponds to Chomsky sentence 3)
================================================================================
C         C->E-gloss                    E'

更        more                          More generally, linguists must
一般地說  generally                     pay attention to a problem.
,                                       That is , how (to) determine
語言學家  linguist                      fundamental properties of[1]
必須      must                          those successful grammars.
關心      to be concerned about;to show concern;concern
的[@]     NOM[@]
問題      problem
就是      that is
怎樣      how
去        aux. verb/(prep.)to
確定      decide;determine
那些      those
成功的    successful
語法      grammar
的[1]     GEN[1]
基本      fundamental
性質      property
.
```

==

Xing Sentence 4 (corresponds to Chomsky sentence 4)

==

C	C->E-gloss	E’
這些	these	(The) ultimate outcome of[1] these
研究	investigation;study;research	investigations should be about
的[1]	GEN[1]	a kind (of) theory of[2]
最後	ultimate	linguistic structure.
成果	outcome	
應該	should	
是	be(is,am,was,are,were)COPULA	
一+種	a/one + kind	
關於	about(coverb)	
語言	language;linguistic	
結構	structure	
的[2]	GEN[2]	
理論	theory	
,		
它	it	
把	(coverb)	
應用	apply	(The) descriptive devices
在	in	(are) applied in particular grammars.
某些	some certain	
具體	particular	
語法	grammar	**(The) descriptive devices (are)
著作	writing	in a kind (of) theory of[2]
裡	in	linguistic structure.
的[@]	NOM[@]	
描寫	descriptive	
方法	device	
抽象地	abstractly	
提出來	take out	(The) descriptive devices (are)
加以	[ ]	taken out and studied abstractly.
研究	investigation;study;research	
,		
而	but	but (the) scope (of) a kind (of)
所	that	theory of[2] linguistic structure
涉及	cover	that (it) covers (does) not limit
的	that	(to) some certain particular
範圍	scope;range	language.
卻並	but	
不	not	
限於	limit	
某些	some certain	
具體	particular	
語言	language;linguistic	
.		

Note: The translation of this portion was not obvious: 此句不明顯.

Xing Sentence 5 (corresponds to Chomsky sentence 5)

C	C->E-gloss	E’
這+種	this + kind	One function of[1] this kind
理論	theory	(of) theory is (to) provide
的[1]	GEN[1]	a method.
功用	function	
之[2]	GEN[2]	
一	one	
,		
就是	that is	(This) method can select a
提供	provide	grammar for(coverb) each
一+個	a/one + CL	language.
能夠	can;may;be able to	
為	for(coverb)	
每一+種	each + kind	
語言	language;linguistic	
(		
只要	only want	(We) want to have sentence
具備	to have	corpus of[3] this language.??
這一	this	
語言	language;linguistic	
的[3]	GEN[3]	
語句	sentence	
素材	corpus	
)		
選擇出	(L&T select out	
一+部	a/one + CL	
語法	grammar	
的[4]	GEN[4]	
方法	method;manner	
.		

```
================================================================================
Xing Sentence 6 (corresponds to Chomsky sentence 6)
================================================================================
C          C->E-gloss                        E'

語言       linguistic;language               A central notion
理論       theory                            of
的[1]      GEN[1]                            linguistic theory
中心       central                           ,
概念       notion                            that is
,          ,                                 linguistic
就是       that is                           level
語言       linguistic                        .
平面       level
(
或者       or
稱         call
為         TO-BE
語言       linguistic;language
層         level
)
的[2]      GEN[2]
概念       notion
.          .
```

Xing Sentence 7 (subpart of Chomsky sentence 7)

C	C->E-gloss	E'
所謂	so called	
語言	linguistic;language	Linguistic level (includes)
平面	level	phonemics level, morphology
,		level, phrase structure
如	such as	level, etc.
音位	phonemics	
平面	level	
,	,	
詞法	morphology	
平面	level	
,	,	
詞組	phrase	
結構	structure	
平面	level	
等	etc.;and so on	
.	.	

```
==============================================================================
Xing Sentence 8 (subpart of Chomsky sentence 7)
==============================================================================
C         C->E-gloss              E'

從        (coverb)
本質      essence                 Essentially (speaking), linguistic
上        in terms of             level (is) a set (of) descriptive
說        say                     devices.
就是      that is
一+套     a + set                 (This) descriptive devices (are)
用        utilize;use             used (for) editing grammar.
於        (coverb)
編寫      edit;compile
語法      grammar
的[&]     NOM[&]
描寫      descriptive
裝置      device
,         ,
語言      linguistic;language     Linguistic levels constitute
平面      level                   (a) certain method (for)
構成      constitute              representing language.
了        -le
某種      certain kind
表達      represent
話語      language
的[#]     NOM[#]
方法      method
.         .
```

```
==============================================================================
Xing Sentence 9 (subpart of Chomsky sentence 8)
==============================================================================
C         C->E-gloss                      E'

我們      we                              First, we construct (the)
首先      first                           form (of) grammar rigorously
把        (coverb)                        and precisely.
合乎      correspond to
這+一     this + one
語言      language;linguistic             (The) linguistic theory
理論      theory                          contains (the) whole set
所        that                            (of) linguistic levels.
包含      contain
的        that
全套      whole set
語言      language;linguistic             (The) form of grammar
平面      level                           corresponds to (the)
的[%]     NOM[%]                          whole set (of) linguistic
語法      grammar                         levels.
形式      form
嚴格      rigorously
而又      and
精密地    precisely
建立起來  construct;constitute
,
然後      then
再        then
調查      investigate                     then (we) investigate
一下      [ ]                             {whether} (we) can use
能        can                             this kind (of) grammar
不        not                             form (to) edit (a) simple
能        can                             (and) clear grammar
用        use                             for natural language
這+種     this + kind                     {or not}.
語法      grammar
形式      form
給        for(coverb)
自然      natural
語言      language;linguistic
編寫      edit;compile
簡單      simple
明確      clear
的[*]     NOM[*]
語法      grammar
.
```

```
================================================================================
Xing Sentence 10 (subpart of Chomsky sentence 8)
================================================================================
C         C->E-gloss                      E'

我們      we                              We can use this kind (of)
可以      can;may                         method (to) determine
用        use                             {whether} (the) linguistic
這+種     this + kind                     theory has defect {or not}.
辦法      manner;method
來        aux. verb
確定      determine;decide
一+種     a/one + kind
語言      linguistic;language
理論      theory
是        be(is,am,was,are,were)COPULA
不        not
是        be(is,am,was,are,were)COPULA
有        has;have
缺點      defect
.
```

```
==============================================================================
Xing Sentence 11 (subpart of Chomsky sentence 9)
==============================================================================
C         C->E-gloss                     E'

我們      we
想        want                           We want (to) study several
用        in(prep.)                      different conceptions (of)
這個      this+CL                        linguistic structure
辦法      manner;method                  in this manner.
來        aux. verb
研究      investigate;study;research
幾個      several
有        has;have
差別的    different
語言      language;linguistic
結構      structure
概念      conception
,
考慮      consider                       we consider a succession
一        a                              (of) linguistic levels.
系列      succession
由        from(coverb)
簡單      simple
到        to(coverb)
複雜      complex
的[&]     NOM[&]
,
跟        (coverb)                       From simple to complex,
越來越    more and more                  (the) linguistic levels
有        has;have                       corresponds to more and
成效的    powerful                       more powerful modes (of)
語法      grammar                        (grammatical description).
描寫      descriptive
方式      mode
相對應    correspond to
的[#]     NOM[#]
語言      language;linguistic
平面      level
.
```

```
============================================================================
Xing Sentence 12 (subpart of Chomsky sentence 9)
============================================================================
C         C->E-gloss               E'

我們       we
還         still
想         want
在         in
這+篇      this + CL                We still want (to) say
論文       thesis                   clearly in this thesis.
裡         in
說         say;speak;talk
清楚       clear
,
要是       if                       If (we) want (to) edit
想         want                     a satisfactory English
編寫       edit;compile             grammar,
一+部      a + CL
令         to make
人         human being;person
滿意的     satisfactory
(
具體       concrete                 (then) English grammar's
一點       a little bit             linguistic theory
說         say                      must contain at least
)                                   these linguistic levels.
英語       English
語法       grammar
的話       if                       OR:
,
其         [pronoun]                (then) linguistic theory
語言       language;linguistic      (of) English grammar
理論       theory                   must contain at least
就         (coverb)                 these linguistic levels.
必須       must
至少       at least
包含       contain
這些       these
語言       language;linguistic
平面       level
.
```

```
==============================================================================
Xing Sentence 13 (corresponds to Chomsky sentence 10)
==============================================================================
C         C->E-gloss                              E'

最後      finally                                 Finally, we want to mention
我們      we                                      (something).
想        want                                    (That is,)
提        to mention                              this purely formal
一下      [ ]                                     investigation
:                                                 of[1] language structure can
這+種     this + kind                             show some
對+[ ]    for;(as to;to;with regard to);(coverb)  interesting implications
語言      language;linguistic                     for semantic (studies).
結構      structure
的[1]     GEN[1]
純        purely
形式的    formal                                  OR:
研究      investigation
對於      for;(as to;to;with regard to);(coverb)  Finally, we want to mention
研究      study                                   (that) this purely formal
語意學    semantic                                investigation of[1] language
也        also                                    structure can show some
是        be(is,am,was,are,were)COPULA            interesting implications
能        can;be able to                          for semantic (studies).
起        show(coverb)
一些      some
有意思的  interesting
啟示      implication
作用的    effect
.
```

```
================================================================================
Xing Sentence 14  (corresponds to Chomsky sentence 11)
================================================================================
C         C->E-gloss                     E'

這裡      here                           (The) motivation problem of[2]
所        that                           particular orientation of[1] (the)
說        say;speak;talk                 research work that (is) said here
的        that                           shall (be) discussed below in $6.
決定      determine;decide
研究      research;study;investigation
工作      work
的[1]     GEN[1]
具體      particular
方向      orientation
的[2]     GEN[2]
動機      motivation
問題      problem
,
將        shall
在        in
後面的    behind;below
$6        $6
中        in
討論      discuss
.
```

4.8. Dictionary

A.	Pin Yin	Character
a	yi;yi+(ge)	一;一+(個)
abstractly	chou xiang di	抽象地
adequacy	jian quan xing	建全性
analysis	fen xi	分析
and	yu;he;bing;bing qie	與;和;並;並且
are	shi	是
as	cheng;dang zuo;[ ]	成;當做;[ ]
at least	zhi shao	至少
attempt to	chang shi;qi tu	嘗試;企圖
available	ke yong (de);	可用(的);
	you xiao (de)	有效(的)
B.		
be	shi	是
be concerned	guan xin	關心
be viewed	bei ren wei; bei kan	被認為;被看
below	hou mian	後面(adv.)
by	gen ju;yi;yi	根據;依;以
C.		
can	ke;ke yi	可;可以
central	zhong xin de	中心的
certain	mou;mou yi;mou zhong	某;某一;某種
	yi din de	一定的
complexity	fu za xing	複雜性(n.)
conception	guan nian	觀念(n.)
consider	kao lu	考慮(v.)
constitute	jian li	建立(v.)
construct	jian zao	建造(v.)
construction	jian zao;jie gou;	建造;結構;
	gou zao	構造(n.)
contain	bao han	包含(v.)
corpus	su cai;yu qun	素材;語群
correspond to	fu he;he hu;	符合;合乎;
	xiang dui ying yu	相對應於
D.		
description	miao xie	描寫(n.)
descriptive	miao xie (de)	描寫(的)(adj.)
determine	jue din;que din	決定;確定(v.)
develop	fa zhan	發展(v.)
device	fang fa	方法(n.)
different	bu tong de	不同的(adj.)
discuss	tao lun	討論(v.)

E.

each	mei yi	每一
english	yin yu	英語
essentially	ben zhi shang	本質上

F.

finally	zui hou	最後
for	wei;wei le;dui;	為;為了;對;
	dui yu;de(GEN)	對於;的(GEN)
form	xing shi	形式
formal	xing shi shang de	形式上的
function	gong yong	功用
fundamental	ji ben de	基本的

G.

general	yi ban xing de	一般性的(adj.)
generally	yi ban xing di	一般性地(adv.)
given	gei yu (de)	給與(的)
goal	mu di	目的
grammar	yu fa;wen fa	語法;文法
grammatical	yu fa (de)	語法(的)

H.

has	you	有
here	zai zhe li	在這裡

I.

if	ru guo	如果
implication	an shi;ti shi	暗示;提示
in	yong;zai...zhong;	用;在...中;
	...zhi zhong	...之中
in particular	te bie;you qi	特別;尤其
increasing	zhu jian de;	逐漸的;
	jian zeng de	漸增的
interesting	wei miao de;	微妙的;
	you qu de	有趣的
investigate	yian jiu	研究(v.);調查
investigation	yian jiu	研究(n.);調查
is	shi	是
it	ta	它(pronoun)
its	ta de	它的

L.

language	yu yian	語言
level	ceng;ceng ci;ping mian	層;層次;平面
linguist	yu yian xue jia	語言學家
linguistic	yu yian	語言

M.

make	zhi zao	製造

manner	fang fa;fang shi	方法;方式
method	fang fa;ban fa	方法;辦法
mode	xing shi	形式
more	geng	更
more and more	yue fa;zhu jian	越發;逐漸
morphology	ci fa;gou ci xue	詞法;構詞學
motivation	dong ji	動機
must	bi xu	必須

N.

natural	zi ran	自然
no	wu;mei you	無;沒有
notion	gai nian	概念

O.

of	de	的
one	yi	一
orientation	fang xiang	方向
outcome	jie lun;cheng guo	結論;成果

P.

particular	ju ti	具體
phonemics	ying wei;ying wei xue	音位;音位學
phrase	ci zu;pian yu	詞組;片語
possibility	ke neng xing; ke shi xian xing	可能性; 可實現性
powerful	you xiao li de	有效力的
precisely	que shi di	確實地
present	biao xian	表現
principle	yan ze;yan li	原則;原理
problem	wen ti	問題
process	fang fa;cheng xu	方法;程序
produce	chan sheng	產生
property	xing zhi	性質
provide	gong gei;ti gong	供給;提供
purely	chun cui di	純粹地

R.

reference	chen shu;ti dao	陳述;提到
report	bao gao	報告
represent	biao da	表達
research	yian jiu	研究
revealing	ming liao de	明瞭的
rigorously	yian ge di	嚴格地

S.

satisfactory	man yi de	滿意的
select	xuan ze	選擇
semantic	yu yi de	語意的
sentence	yu ju;ju zi	語句;句子

set	tao	套
several	ji zhong (de)	幾種(的)
shall	jiang;jiang yiao;hui	將;將要;會
should	ying gai	應該
show	zhan shi	展示
simple	jian dan (de)	簡單(的)
some	mou xie;yi xie	某些;一些
sort	zhong lei	種類
specific	te din de	特定的
structure	jie gou	結構
study	yian jiu	研究
successful	cheng gong de	成功的
succession	xi lie	系列
such as	zhu ru	諸如
suggest	jian yi;ti chu	建議;提出
syntactic	ju fa (de); zao ju fa (de)	句法(的); 造句法(的)
syntax	ju fa xue;zao ju fa	句法學;造句法

T.

that	[ ];na;na ge	[ ];那;那個
the	[ ]	[ ]
then	ran hou	然後
theory	li lun	理論
these	zhe xie	這些
this	zhe+(yi);zhe	這+(一);這
to	dui yu;dao;[ ]	對於;到;[ ]

U.

ultimate	zui hou de	最後的
under	zai...zhi xia	在...之下
underlying	ji chu de	基礎的
utilize	ying yong;yong	應用;用
utterance	shuo fa	說法

W.

we	wo men	我們
which	[ ];na yi ge	[ ];那一個
with	[ ]	[ ]
within	zai...(yi) nei; ...yi nei	在...(以)內; ...以內

Note

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5. Bibliography

Chomsky, Noam. Syntactic Structures. Mouton. 1957.

Haegeman, Liliane. Introduction to Government and Binding Theory. Blackwell. 1991.

Liang et al 1972 A New Practical Chinese-English Dictionary The Far East Book Co., Ltd., Taipei, Republic of China, 1972.

Li, Charles N. and Sandra A. Thompson. Mandarin Chinese A Functional Reference Grammar University Of California Press. 1981

Wang, William S. Y. and Hsiao-tung Lu. Syntactic Structures Hong Kong University Press. 1966

Wu et al 1973 Continental's Concise English-Chinese Dictionary Continental Bookstore, Taipei, Republic of China, 1973

Xing et al 1979 translation of Syntactic Structures Chinese Academy of Science Publishing House, Beijing, People's Republic of China, 1979

Notes

1. We assume a generic version of X-bar structure, such as that discussed in Haegeman 1991.