27

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on

Computational Linguistics
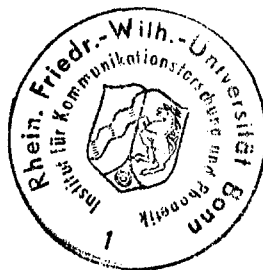
DATA PREPARATION FOR SYNTACTIC TRANSLATION

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ABSTRACT

The following paper discusses the preparation of syntactic data for use in a generalized language transla- tion system, developed by the Linguistics Research Center at The University of Texas. Capabilities and limitations of translation by syntactic model are outlined and compared with the word-for-word model.

BACKGROUND

In January of this year the Linguistics Research Center held its first demonstration of an operational system for experimental translation of languages. We prepared a limited set of test data and used a pre-selected input text to demonstrate the operational status of computer programs in the system. I shall discuss briefly the model on which the translation system is based and the preparation of linguistic data used in the demonstration.[1]

LINGUISTICS RESEARCH CENTER

Two principal objectives at the Linguistics Research Center have been the development of a generalized automatic translation system and the development of a linguistics computer system consisting of programs designed to facilitate the collection and maintenance of data for the translation system [7]. In addition to these objectives, we have undertaken related studies in information retrieval and automatic classification [1, 2]. The philosophy behind our research effort may be characterized as one of seeking general solutions to language description and translation as opposed to one of designing specialized

algorithms. The general principles underlying our research
have been discussed elsewhere, and I shall not dwell on them
here [4; 5; 6; 8, pp. 3-14; 9].

Three organizational subdivisions of the Center
are the Theoretical Linguistics Group, the Descriptive Lin-
guistics Group and the Systems Group. Activities at the
Center are distributed over these and other specialized
areas in order to facilitate research. Results reported
in this paper are presented from the point of view of acti-
vities in the Descriptive Linguistics Group.[2]

The Descriptive Linguistics Group is currently
engaged in maintaining research data in six languages:
Chinese, English, German, Hebrew, Russian and Spanish.
We are also maintaining data for independent, non-supported
research in Hindi and Old Saxon. We have just begun main-
taining data for Japanese. Plans are being made to add
French to the data in the Linguistics Research System in
the near future.

LINGUISTICS RESEARCH SYSTEM

The Linguistics Research System is a hierarchical
system of computer programs, which, in addition to programs
in the experimental translation system, includes programs de-
signed to support a stratified description of language data

(see fold-out entitled LINGUISTICS RESEARCH SYSTEM). In
the illustration the large boxes marked MAINTAINANCE at
the upper and lower part of the page represent the system
of programs in which we collect and maintain language and
descriptive linguistic data. The system of large boxes
running across the middle of the page represents the
translation system. Details of these programs will be
found in [8, pp. 83-103]. I outline the functions of pro-
grams in the translation system below.

TRANSLATION MODELS

Various models have been proposed for automatic
translation of languages. The models have been character-
ized into at least three levels of increasing complexity
and sophistication: 1. Word-for-word, 2. Rule-for-rule
or syntactic, 3. Transformational-semantic. The inade-
quacies of type 1. are known. Most of current investiga-
tion is concentrated in some form or other on type 2.,
while type 3. models remain largely speculative. Trans-
lation programs have been completed which will simulate models
1. and 2.

In model 1. we may perform word-for-word trans-
lation by presenting an input corpus (see fold-out) to

the LEXICAL ANALYSIS program. Analysis results in recognition of whatever forms have been defined in the lexical grammar. The results are transferred from the analysis program in MONOLINGUAL RECOGNITION to the LEXICAL ANALYSIS program in INTERLINGUAL RECOGNITION. Intermediate display programs are ordinarily by-passed in the translation mode. The data then pass to an INPUT TRANSFER tape before entering the TRANSFER program. This program processed INPUT TRANSFER data against data from the INTERLINGUA tape to produce an OUTPUT TRANSFER tape. OUTPUT TRANSFER data pass into the LEXICAL SYNTHESIS program in INTERLINGUAL PRODUCTION to be converted to an acceptable form for input to LEXICAL SYNTHESIS in MONOLINGUAL PRODUCTION. The resulting data pass on to the OUTPUT CORPUS tape which serves as input to the CORPUS DISPLAY program.

Output from this lowest level of translation would be word-for-word, morph-for-morph, etc. matching the order of input forms. There would be no control over output morphology or syntax. We have not considered it worthwhile to attempt to use model 1. translation independently of model 2.

Model 2. translation in the Linguistics Research System performs in a fashion operationally similar to model 1. Instead of operating (horizontally on the fold-out) directly through the lexical level, however, we initiate

the translation input in LEXICAL ANALYSIS and pass the
resulting data (vertically) into SYNTACTIC ANALYSIS.
Model 2. translation now continues horizontally on the
syntactic level analogously to the manner described for
the lexical level.

Output resulting from the syntactic transla-
tion model observes the requirements for well-formedness
in output language morphology and syntax. Examples from
the January demonstration are given below. With large
volumes of grammar data, this model is not expected to
provide all the semantic collocational controls which we
as linguists will want to maintain. Nor will it properly
account for problems such as pronominal reference. These
and other transformational problems will be dealt with in
a still higher order of description and programming. The
semantic order of programming has only recently been
undertaken.

The translation model used in the January demon-
stration is essentially a type 2. model, although it con-
tains some features proposed for type 3. models. Analysis
is performed on the input language with a context-free
phrase structure grammar. The structures which are thus
identified are transformed into equivalent output language
structures by the so-called transfer grammar. Translation
output is then generated through a context-free phrase
structure grammar of the output language [13].

Rules for use in a similar model are given by
Ilse Langerhans [3]. The essential difference, however,
between our model and that proposed by Langerhans is
that in the latter the input language is analyzed into
kernels, the kernels matched with equivalent output lan-
guage kernels, and the output language kernels transformed
into finished expressions.

PREPARATION OF DATA

For the demonstration, we selected a text in
psychology to use as a test corpus in German, the input
language (Appendix A). The corpus consisted of the first
six paragraphs of an essay appearing in UNIVERSITAS [10].
Members of our staff then prepared an English translation
to be used as a test corpus in the output language (Appen-
dix B). We use test corpora for verifying the morpho-
syntactic description in each language before attempting
to use the grammars in the translation system. To illus-
trate the details of data preparation, I have chosen the
second sentence from the third paragraph of text (Fig. 1).
This sentence was chosen for reasons of simplicity and
economy of description. It is typical, however, of trans-
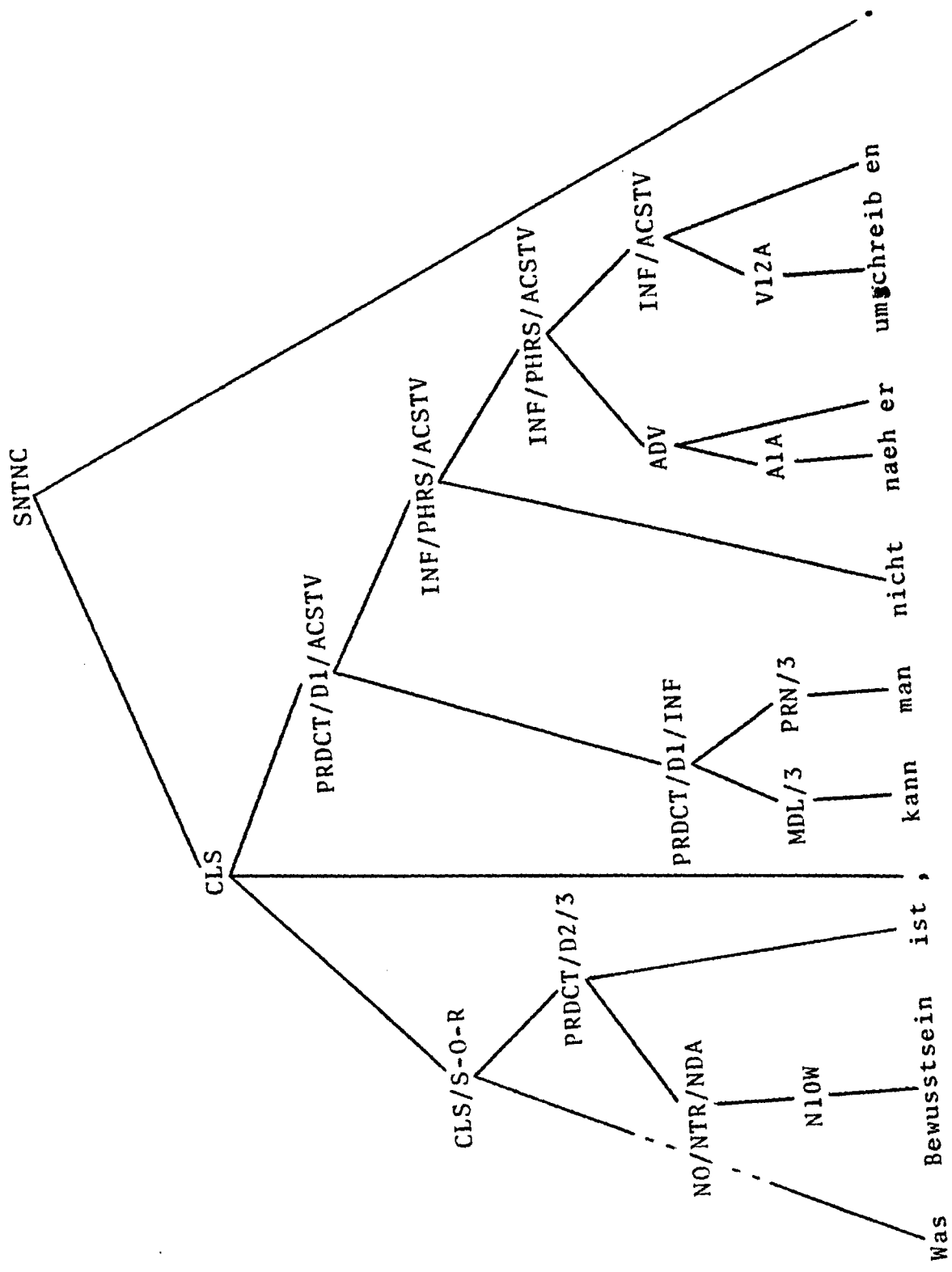formational problems in syntactic translation. We pro-

Figure 1

vided a phrase structure description for the sentence, labelling those features of construction which would be necessary for morpho-syntactic (as opposed semantic) grammaticality in German. The description contains, therefore, more information than is necessary for recognition. But we are designing our grammars, in general, for bi-directional use. A similar description was provided for the English translation (Fig. 2).

After diagramming each sentence, we encoded the information contained in the diagrams in an equivalent phrase structure notation [14]. The data were then compiled in the computer system. As rules are compiled for each language, each rule is randomly assigned a permanent identification number. After the respective grammars are compiled and displayed, we refer to them for the identification of each rule and record the appropriate number by each occurrence of a rule in the diagram. The diagrams then appear as in Figures 3 and 4.

VERIFICATION OF DATA

To insure that a description for any given sentence is complete, we perform analysis on the sentence in the computer, using the grammar data accumulated up to that point. If automatic analysis is successful, we ex-
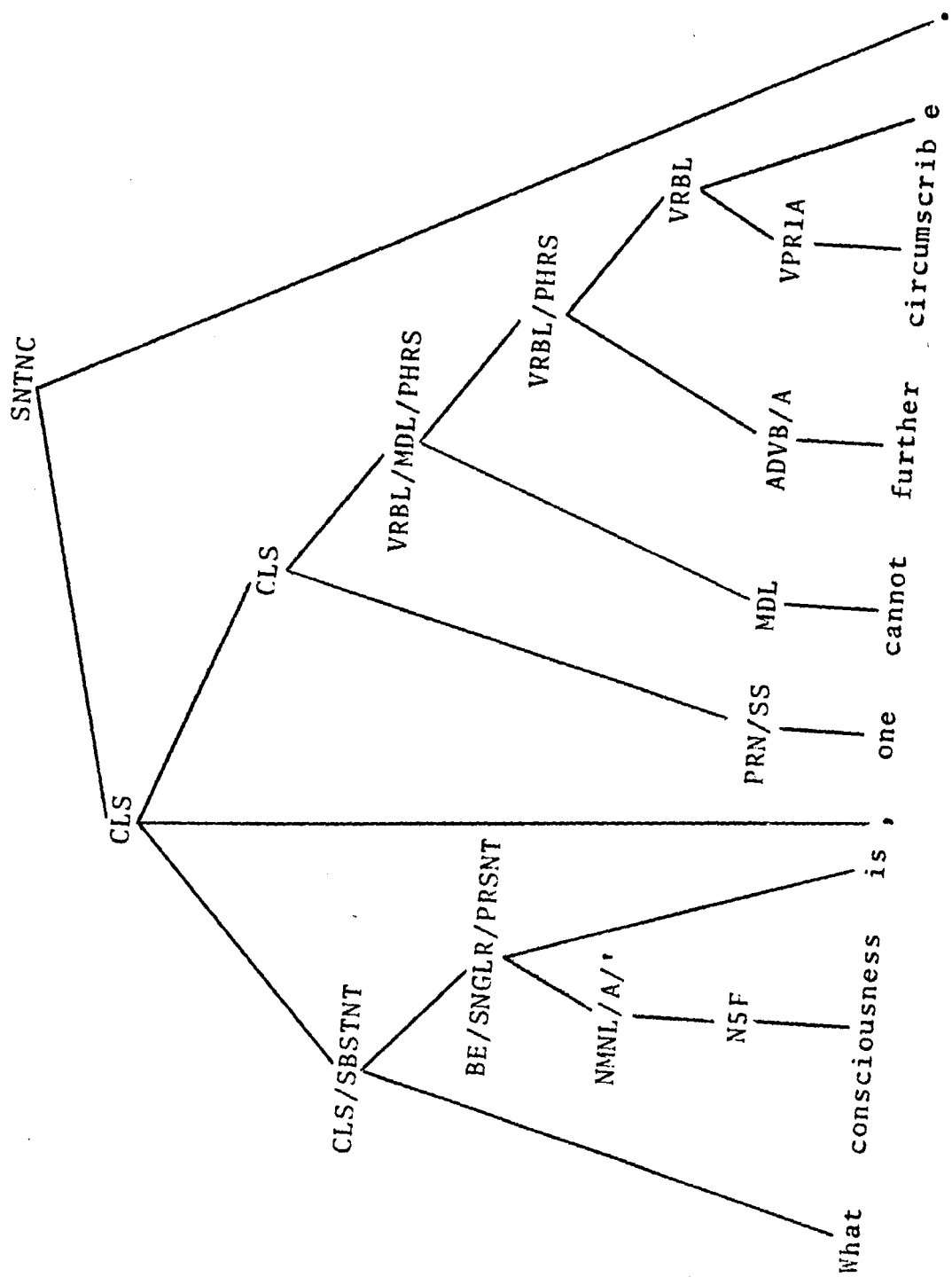
Figure 2

TOSH 10 .

SNTNC

785

CLS

999   PRDCT/D1/ACSTV

CLS/S-O-R   10234   INF/PHRS/ACSTV

25679   626   INF/PHRS/ACSTV

PRDCT/D2/3   INF/PHRS/ACSTV   1037   INF/ACSTV

9849   PRDCT/D1/INF   ADV   628

NO/NTR/NDA   10241   627   V12A

N10W   42|138   MDL/3   PRN/3   A1A   42094

42|321   10|35   9|64   25|835

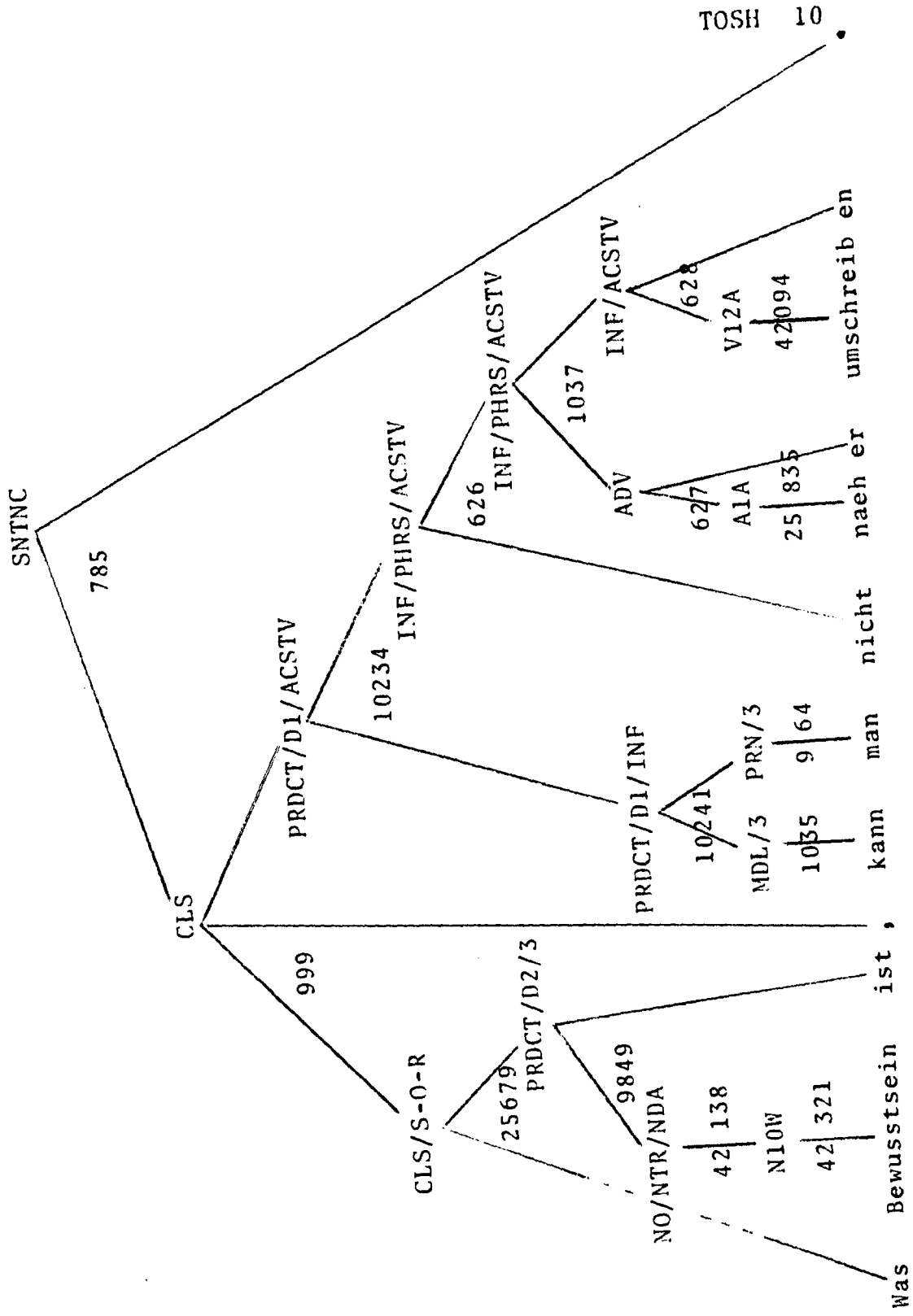Was Bewusstsein ist , kann man nicht naeh er umschreib en
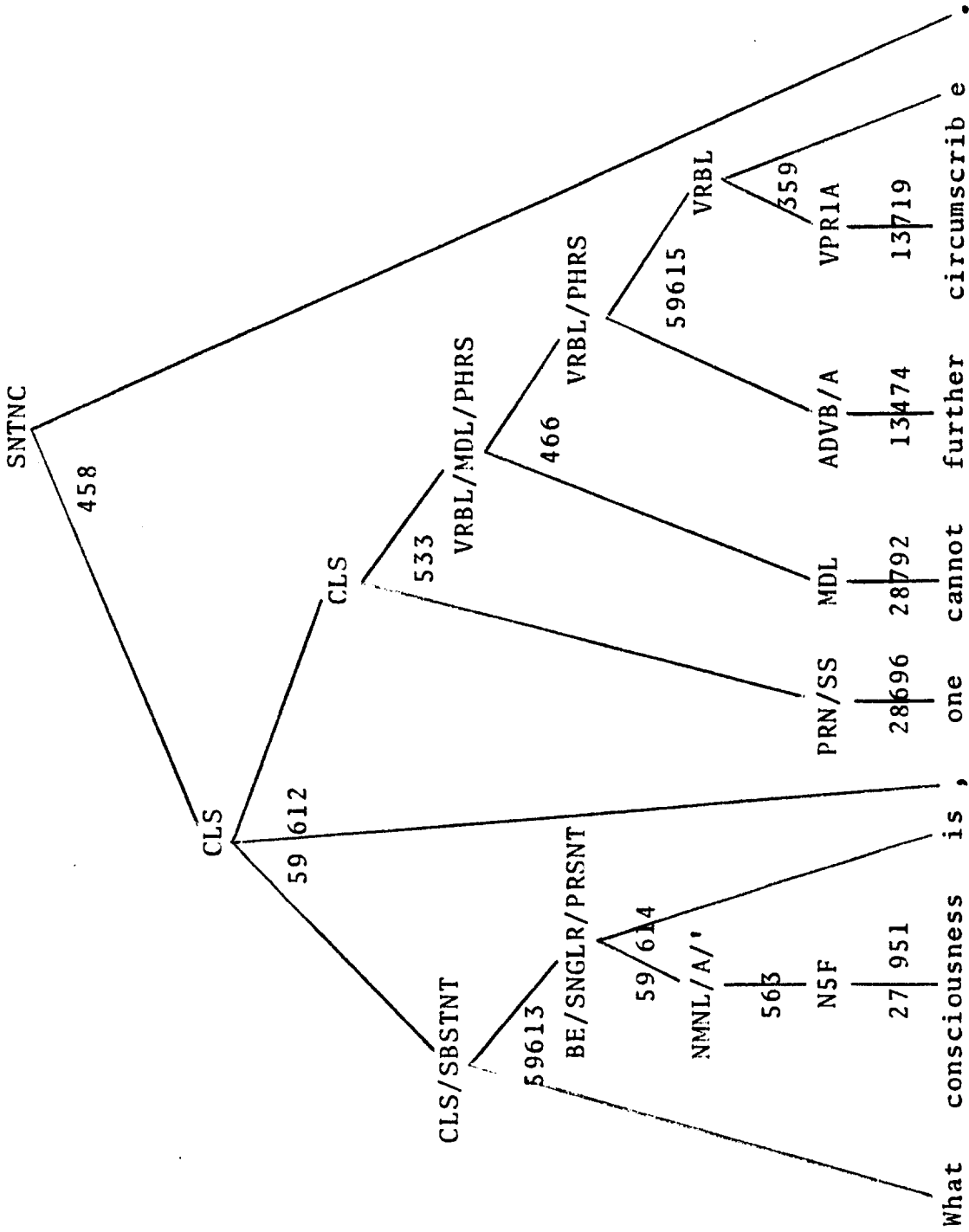
Figure 3

Figure 4

pect to see at least the analysis output corresponding
to the information recorded in the diagram for the sen-
tence. Often there are alternative analyses. If auto-
matic analysis is incomplete, we reconstruct the rules
needed and (re)compile them in the grammar. I shall
not go into the details of analysis here, as they have
been presented elsewhere [8, 12, 13].

TRANSLATIONAL TRANSFORMATIONS

        After we verified the descriptions in each
language, we went on to define the basis of interlin-
gual transformation relationships. We selected a pair
of sentences, one from each of the two languages. They
are defined as equivalent in meaning by bi-lingual in-
formants. Given the pair of sentences, we mapped corres-
ponding sub-structures from one sentence on to the other.
This information was recorded on the diagrams by circum-
scribing the sub-structures (Fig. 5). Normally these
lines are added directly to the diagrams. For the sake
of simplicity, I have omitted branching diagrams and
class names from the illustrations. After we established
the correspondences between each pair of sub-structures,
we inspected each sub-structure to see of what it was

composed.   I have represented this information in Figures
6 and 7 by the rule number(s) contained in each sub-structure.

Suppose now we want to "transform," i.e., trans-
late the expression <u>Bewusstsein</u> into the expression <u>con-</u>
<u>sciousness</u>.   <u>Bewusstsein</u> (Figs. 3, 6) is represented by
the rule

$$42321: \quad N10W \rightarrow Bewusstsein$$

<u>Consciousness</u> (Figs. 4, 7) is represented by the rule

$$27951: \quad N5F \rightarrow consciousness$$

We define the equivalence of these two expressions by
writing the bi-directional transformation T_x:

$$[42321]_g \leftarrow T_x \rightarrow [27951]_e$$

This is equivalent to writing a reversible transformation
between the structures of Figure 8.

Figure 8

<div style="text-align:center">

N10W   N5F

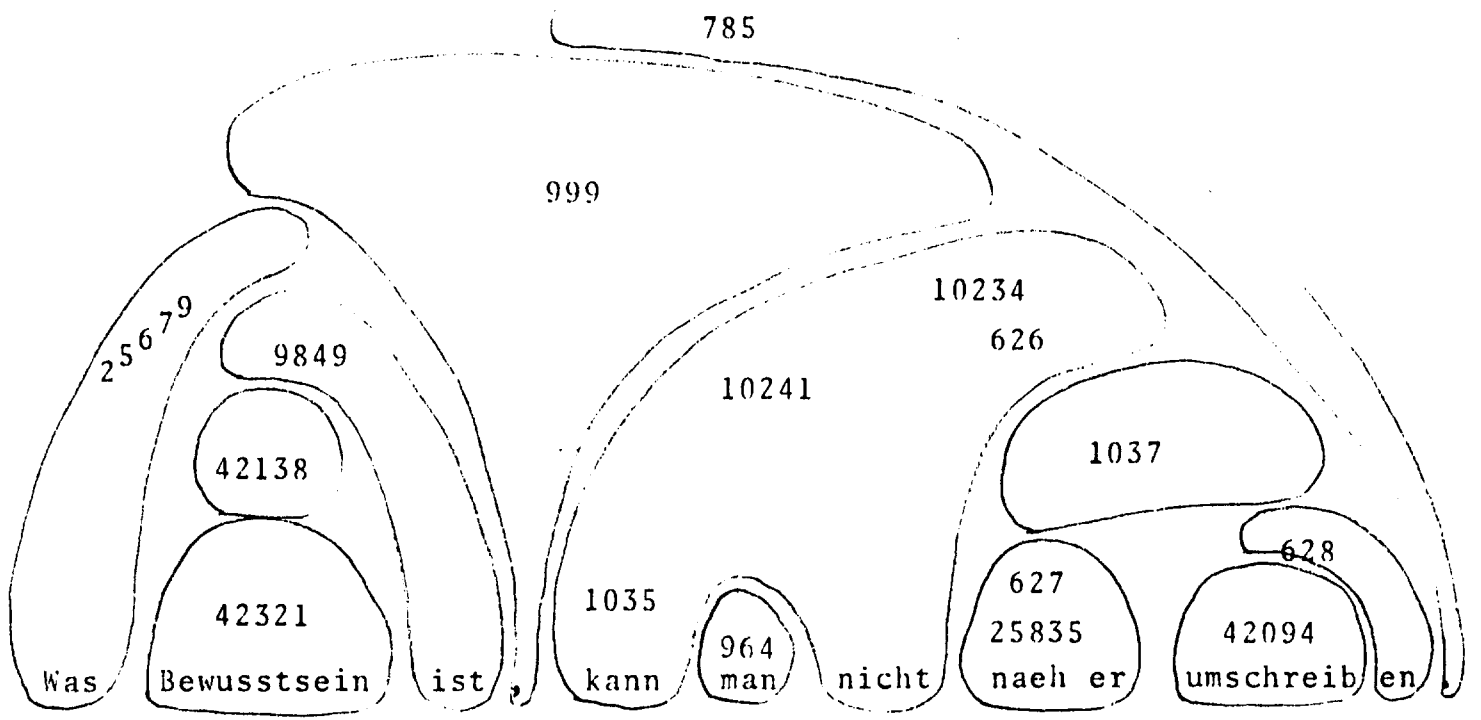Bewusstsein   ←→   consciousness
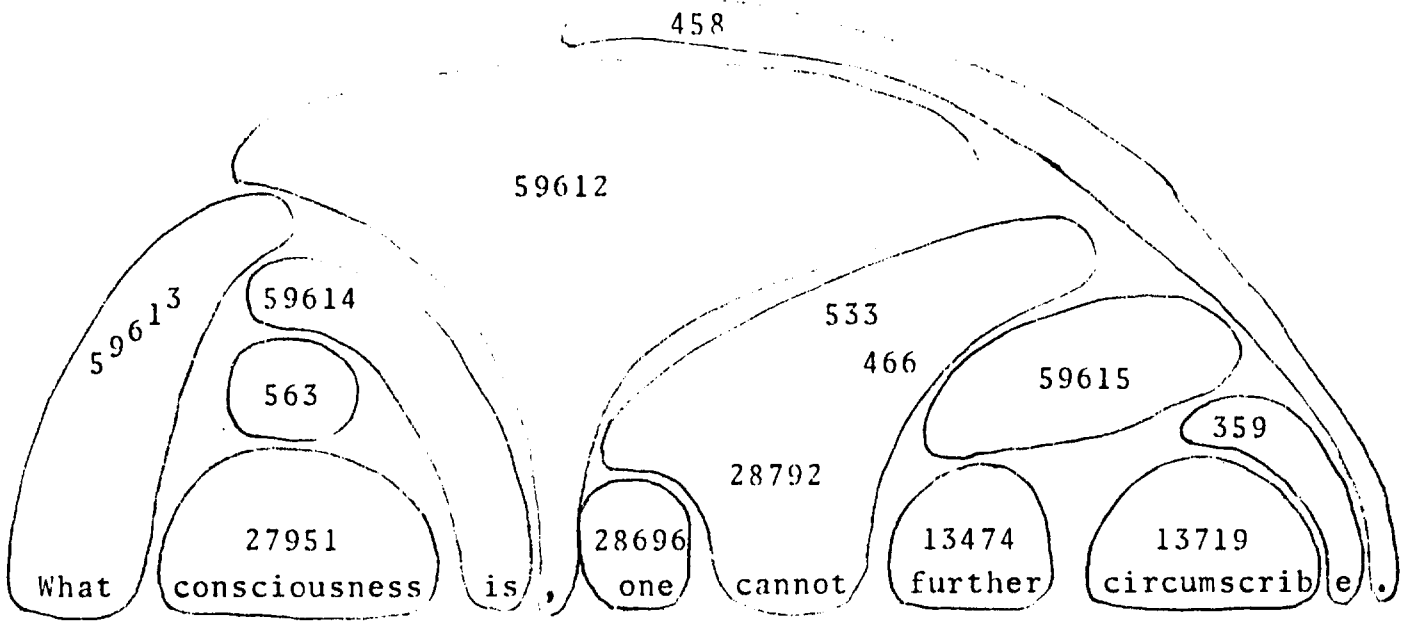
</div>

Figure 6

Figure 7

Similarly, we may translate from an infinitive construction in the one language into a corresponding construction in the other.   The infinitive of umschreib- is formed with -en by the rule

$$628: \quad INF/ACSTV \rightarrow V12A + en$$

The corresponding English construction is formed by the rule

$$359: \quad VRBL \rightarrow VPR1A + e$$

We record thus the transformation T_y

$$[628]_g \leftarrow T_y \rightarrow [359]_e$$

to define the translation equivalence.   This is equivalent to writing the transformation in Figure 9.

Figure 9

```
       INF/ACSTV                      VRBL
         /\                            /\
        /  \                          /  \
       /    \                        /    \
      /      \                      /      \
   V12A¹  +  en      ←→      VPR1A¹  +   e
```
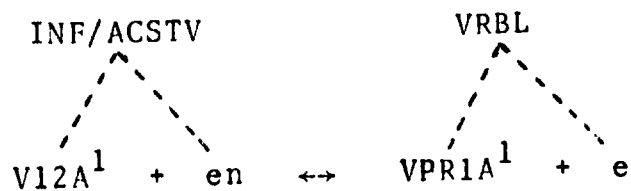
The foregoing examples are typical of the many rule-for-rule correspondences to be found in a pair of structurally similar languages.

Of greater interest are those transformations of pairs of structures which are dissimilar in terms of constituent rules. In Figure 6 the sub-string kann (man) nicht (naeher umschreiben) is analyzed in part by the rule sequence 10234 + 10241 + 1035 + 626. The sub-string consists, furthermore, of a subject-verb inversion characteristic of German syntax. We may transform this construction of four rules into the corresponding English construction (Fig. 7) of three rules 533 + 466 + 28792 by writing the transformation T_z:

$$[10234 + 10241 + 1035 + 626]_g ← T_z → [533 + 466 + 28792]_e$$

This is equivalent to writing a transformation on the structures in Figure 10.

Figure 10

kann + PRN/3^1 + nicht + INF/PHRS/ACSTV^2 ↔ PRN/SS^1 + cannot + VRBL/PHRS^2
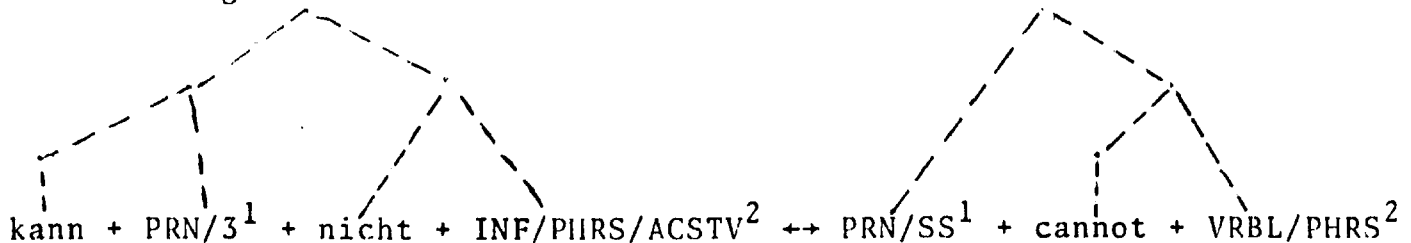
The transformation brings us from the subject-verb in-
version of German into the normal subject-verb order for
English. Superscripts are associated with all class names
in phrase structure rules in order to maintain proper order
of content substitution during transformation from one
structure to another [13, pp. 12f, 51-66].

TRANSLATION OUTPUT

        After all translation data have been collected
and compiled for a given test corpus, the next step is to
verify the data in the computer system by attempting to
carry out automatic translation. As in the case of auto-
matic analysis, we expect translation output corresponding
at least to the target language structures for which we
have set up translation rules. That is, we expect in the
case of successful translation an output which resembles
within satisfactory limits the human translation given as
the ideal goal. There may be, in addition, various alter-
native paraphrases, but the content should be essentially
the same. The more likely case in the beginning stages,
naturally, is partial success mixed with failure.
        Our first output for German to English transla-
tion is given in Appendix C. The unsatisfactory quality

in this example is the result of a combination of program
errors and inadequate linguistic data. Word-for-word out-
put would produce results quite similar to this sample.
Receiving such results, we referred back to the appropri-
ate sentence diagrams and lists of translation rules to
reconstruct the rules necessary for well-formed output.
A subsequent run with the needed additional translation
rules is displayed in Appendix D.[3]

　　　If we compare the computer translation (Appendix
D) with the human translation (Appendix B), they appear
quite similar at first glance, as indeed we should hope
they would be. A closer inspection, however, reveals
numerous differences. Some of these result from weak-
nesses in description as limited by the model, while some
result from the alternatives implicit in the descriptive
data -- alternatives which the model is designed to cope
with.

　　　In the first or title paragraph, the German
title is constructed in the framework of a prepositional
phrase beginning with ueber. Since the human translation
was prepared without a preposition, transformation rules
were set up to delete the preposition accordingly in the
computer version of the English output. This is probably
not advisable, however, since in the syntactic model there

is no satisfactory way to distinguish contextually a prepositional phrase functioning as a title from its other uses. The implication is, then, that we should reformulate our transformation for this context to produce an English preposition like on.

The human and machine translations are identical in the first sentence of paragraph 1 denoted by the numbers 74 001 in the left margin (Appendices A, B, D). The German adverb allein, which is an element in the relative clause modifying the subject-noun head, has been transformed into the English adverb only, which now is a member of the corresponding English subject-noun head construction and not an element of the following relative clause. For the German clause das Problem...so verzweigt, we have transformed into the corresponding English clause the problem...so complex, inserting a copula verb is. Finally, in the last clause of the German sentence there is a passive construction which has been transformed into an equivalent English active construction. There are transformations of similar complexity throughout the remainder of the corpus.

There is an interesting difference between the last sentence of the human translation of paragraph 1 and the machine translation. In the human translation the sentence ends ...problem of a dependence of mental processes on the body. In the machine translation the sen-
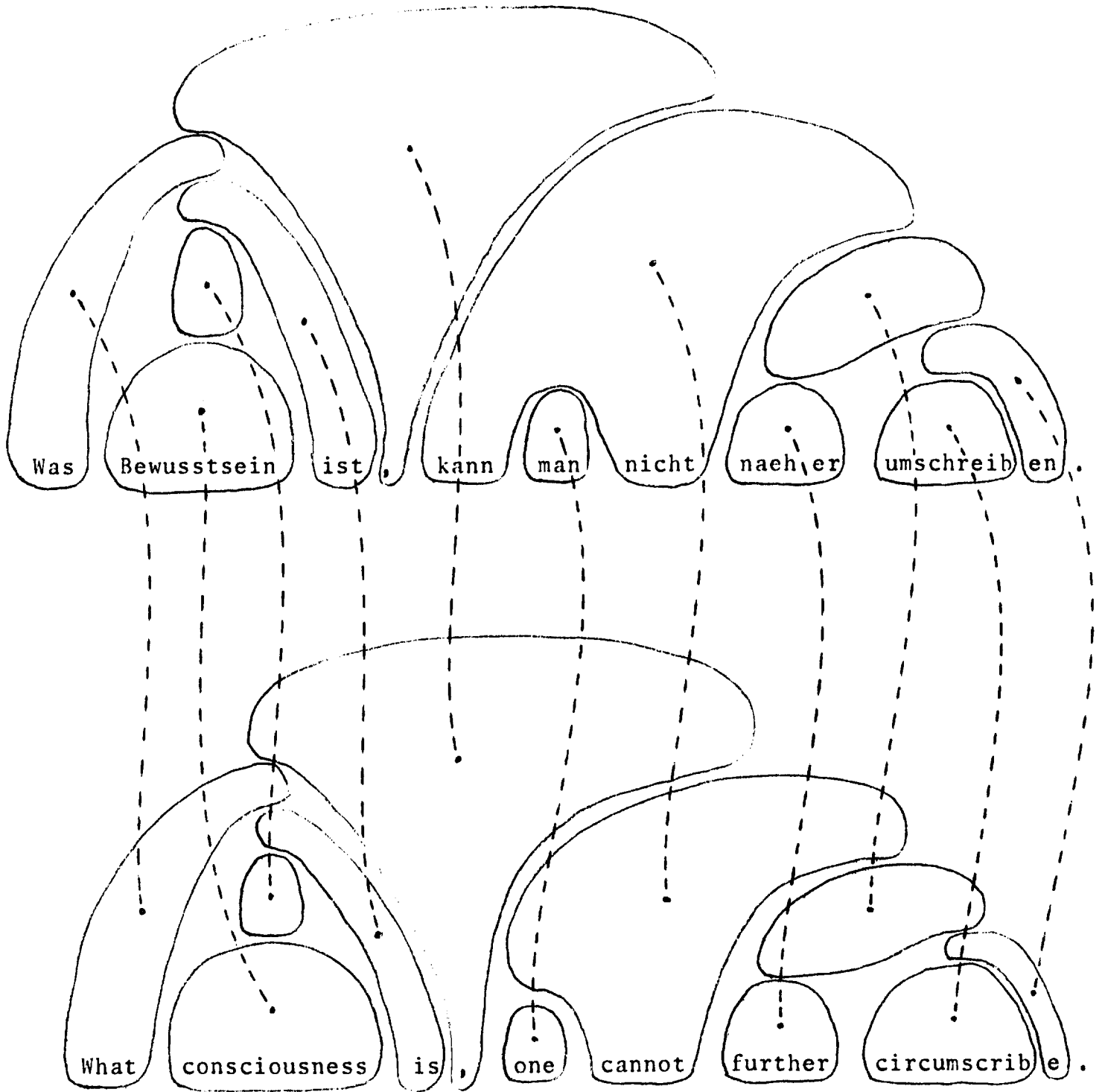
Figure 5

tence ends ...problem of a physical dependence of mental
processes. Although all the necessary grammar rules and
transformations were available to the translation system
for producing an output identical with that of the human
translation, it is interesting that the system picked
instead an alternative paraphrase (and a potentially con-
fusing one) which was more similar to the syntax of the
original German input. The system's choice was made on
the basis of certain probability parameters available to
it and with which we are in continual experimentation.
It is not surprising that the system selected such an
alternative, for we expect such to be the case in the pre-
sent model. What is interesting, however, is the fact
that a choice was available even within the limited data
set which we prepared for these few paragraphs. For this
experiment the system had available to it dictionary data
for the entire article of 32 paragraphs. With respect to
syntactic data, however, it was quite limited since we
supplied just the rules necessary to carry out analysis
and/or synthesis of the six paragraphs involved in the
experiment. Furthermore, we had limited ourselves in the
transformation data to a choice of one syntactic output
for each sentence -- the output identical with that of
the human translation. Nonetheless, it is evident that
in this small data set there are already sufficient

implicit relationships to permit unplanned for if not
unexpected paraphrases.

LIMITATIONS IN THE MODEL

Paragraph 2 of Appendix D contains probably the
most frequent and characteristic examples of deviation
from an ideal output. The paragraph contains a number of
aberrant pronominal forms. Since German contains the forms
er, es, sie and all their variant case forms and since all
these forms are ultimately correlatable with all forms of
English he, she, it, it follows that we may generate any
one of the English third sinpular pronouns from any one of
the German third singular pronouns. In the model presented
here, we have not, for instance, classified nouns on the
basis of such features as gender, animateness, concreteness,
etc. Thus, in the first sentence of paragraph 2, we have
not classified either reader or brain as to referential
gender. Consequently, at the moment when the translation
system is prepared to generate a pronoun following the
sequence ...at this moment when..., the English grammar
is so constructed and tied into the transformation-transfer
data that the system may generate (just the proper case
form of) all three third singular pronouns. Which one is

generated depends on which rule has the highest probability value, in this case the rule producing the expression it, since this is the most frequent of the pronouns in the text.

It is not clear that the proper choice of English pronoun gender could be specified even if we included in the syntactic description such features as gender, animateness, etc. For some instances of pronoun-antecedent agreement will remain ambiguous, given two or more antecedents. The ambiguity occasionally cannot be resolved without resort to reference to the extra-linguistic environment. The first sentence of paragraph 2 is perhaps a case in point. Given the general context of psychology in which the test corpus was written, it is conceivable that either the pronoun he or it could refer back to the appropriate respective antecedents reader or brain.

In those cases where pronoun-antecedent agreement can be stated within the linguistic environment, we should of course be prepared to build such features as gender, animateness, concreteness, countableness, and a host of other such features into our grammars--features which have been difficult to account for systematically before the advent of stratificational, tagmemic and transformational techniques.

In the grammars we have undertaken so far for the several languages, we have tended to exclude such features from morpho-syntactic description.

EXPANDING THE MODEL

We shall include features such as lexical collocation (agent-action agreement) and transformations of semantic equivalence in a systematic description of a higher order which presupposes a morpho-syntactic description for each language [8, pp. 66-71]. The following analogy might be drawn: just as strings of alphabetic and other characters are taken as a body of data to be parsed and classified by a phrase structure grammar, we may regard the string of rule numbers generated from a phrase structure analysis as a string of symbols to be parsed and classified in a still higher order grammar [11; 13, pp. 67-83], for which there is as yet no universally accepted nomenclature. The term transformational strongly suggests itself and is widely used, but the term semantic may seem more appropriate to others.[4]

PROJECTIONS

During the coming year we shall proceed to
expand syntactic description of all languages now under
investigation. Sufficient transfer data will be com-
piled between pairs of languages to test the general
validity of the model and the general adequacy of the
system of programs we are now using. Several questions
suggest themselves with respect to limitations of the
model, among them: 1. how large will the syntactic
description of a language be in terms of rules before
the grammar converges on the languages, and 2. in what
ways can we improve the quality of translation by using
a more soſhisticated model, say one in which there is
a grammar of structural semantics? We shall be occupied
primarily with these two questions in an effort to anti-
cipate the need for modifying elements of the transla-
tion programs and in an effort to test empirically with a
comprehensive data base some of the more recent theories
and notions of linguistics.

FOOTNOTES

1. Research at the Linguistics Research Center is supported
    by the National Science Foundation, the U. S. Army
    Electronics Laboratories, the U. S. Air Force and the
    Latin American Institute of The University of Texas.

2. Recognition is due the entire LRC staff, present and
    past, for success in the results reported here. Among
    the linguists who contributed more immediately to the
    underlying data are: T. Baker, T. Git, M. Prince,
    K. Ryan, R. Stachowitz, A. Staves, C. Swinburn. In-
    tensive preparation of test data for the demonstra-
    tion covered the period from August, 1964 to January,
    1965. General research and development of programs
    have been under way since May, 1959.

3. On comparing the computer and human versions of the
    English translation with the German version, the
    reader is reminded that nowhere are any corpus data
    stored explicitly in the translation system of programs.
    Only raw corpus data in the source language are fed in
    as input to the analysis programs in the system. The
    analysis and synthesis programs use grammatical des-
    criptions in both languages with attendant transfor-
    mation/translation rules to produce output in the
    target language from the analysis-transfer-synthesis
    cycle.

4. Perhaps a passing observation is in order. The term
    transformational, borrowed from mathematics, is a
    term generally applicable to any process of mapping
    equivalences of one structure onto another and so
    is applicable to all levels of linguistic description.

FOOTNOTES (CONTINUED)

It should not, therefore, be used to denote a particular

level in a hierarchical structure. The term <u>semantic</u>,

on the other hand, may perhaps come to be universally

accepted as a hierarchical expression in some series like:

> pragmatic
> logical
> semantic
> syntactic
> morphological
> phono-/graphological

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THE UNIVERSITY OF TEXAS
LINGUISTICS RESEARCH SYSTEM
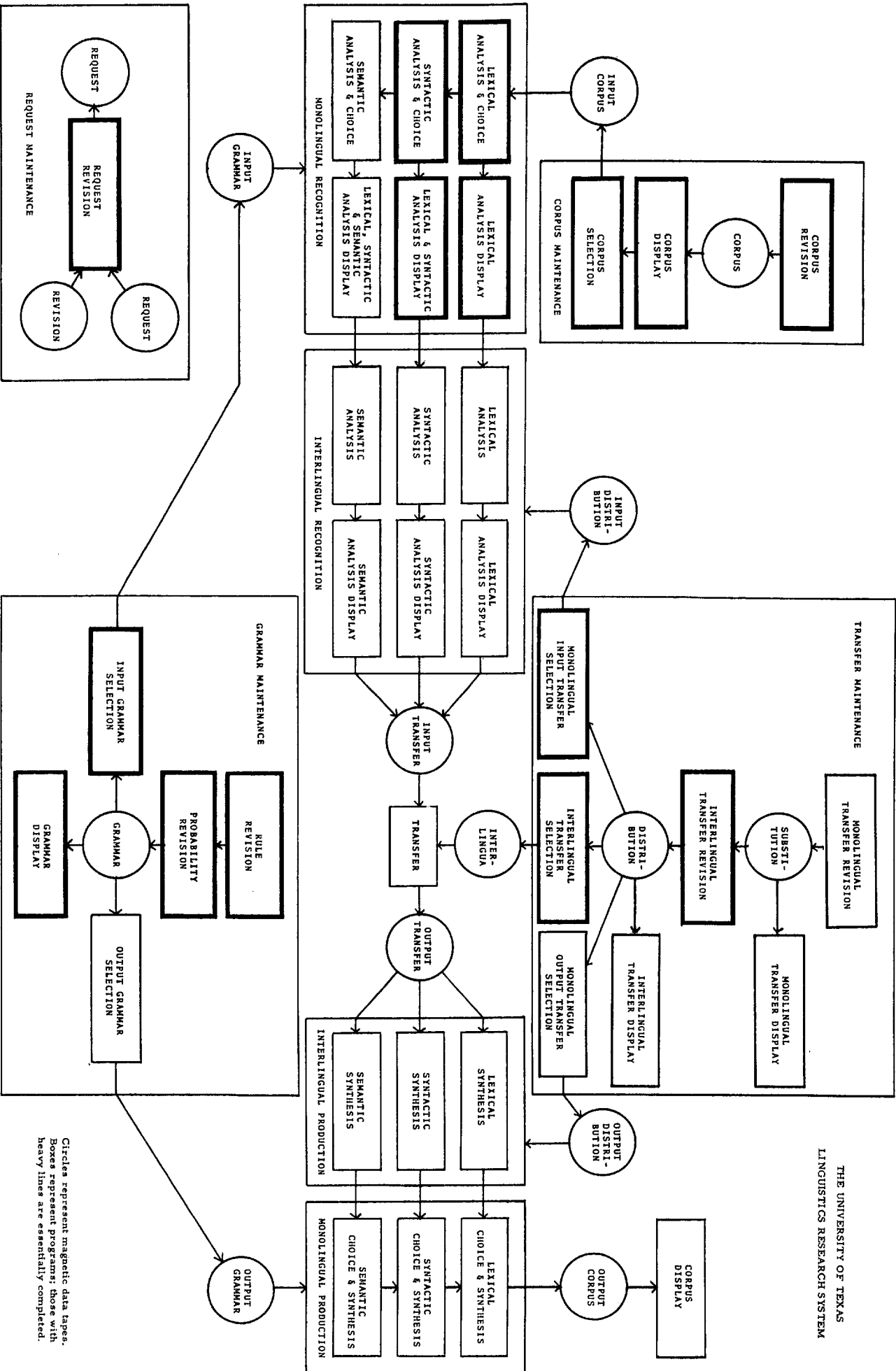
Circles represent magnetic data tapes.
Boxes represent programs; those with
heavy lines are essentially completed.

GERMAN INPUT TEXT
CORPUS DISPLAY

74000001   74
74000002   UEBER DIE PHYSIOLOGISCHE GRUNDBEDINGUNG DES BEWUSSTSEINS
74000003   (AUFSATZ VON PROF. DR. HANS SCHAEFER, UNIVERSITAET HEIDELBERG,
74000004   IN/1/ /5/UNIVERSITAS/5/, OKTOBER 1959, 14. JAHRGANG, HEFT 10,
74000005   SEITE 1079-1090)
74000006
74001001   DIE KOERPERLICHEN BEDINGUNGEN, UNTER DENEN ALLEIN BEWUSSTSEIN
74001002   MOEGLICH IST, SIND RECHT MANNIGFALTIG, DAS PROBLEM DER KOPPLUNG
74001003   VON PSYCHISCHEM AN DIE STRUKTUR UNSERES GEHIRNS SO VERZWEIGT, DASS
74001004   IN EINEM AUFSATZ NUR EIN TEILPROBLEM HERAUSGEGRIFFEN WERDEN KANN.
74001005   WAS HIER BEHANDELT WERDEN SOLL, STELLT DAS (WIE ICH GLAUBE)
74001006   WESENTLICHSTE PROBLEM EINER KOERPERLICHEN BEDINGTHEIT
74001007   SEELISCHER VORGAENGE DAR.
74001008
74002001   I
74002002   DER ZUSTAND, DEN DAS GEHIRN DES LESERS IN DIESEM AUGENBLICK
74002003   AUFWEIST, WO ER SICH ENTSCHLOSSEN HAT, EIN SO KOMPLIZIERTES THEMA
74002004   MIT DEM VERFASSER GEMEINSAM ZU BETRACHTEN, IST DER EINER WACHEN
74002005   AUFMERKSAMKEIT. IN IHM ... D.H. IN DEMJENIGEN TEIL SEINER PERSON,
74002006   DEN ER SEIN /5/ICH/5/ NENNT UND DER SEINER SELBSTBEOBACHTUNG IN DIES
74002007   EM MOMENT OFFENLIEGT, FINDET ER JETZT EINE REIHE VON UEBERLEGUNGEN
74002008   VOR, DIE TEILS MIT DEM GLEICH SIND, WAS DER VERFASSER ZUR ZEIT DER
74002009   ABFASSUNG DIESES AUFSATZES AUCH UEBERLEGTE. TEILS WEICHEN SEINE
74002010   GEDANKEN VON DENEN DES VERFASSERS EIN WENIG AB, WAS ALLEIN DADURCH
74002011   VERSTAENDLICH IST, DASS DER VERFASSER DIESE GEDANKEN PRODUZIERTE,
74002012   IM UEBRIGEN AUCH FUER RICHTIG HAELT, DER LESER DAGEGEN DER
74002013   /5/NACHDENKENDE/5/, WEIL EMPFANGENDE IST UND DABEI HOFFENTLICH
74002014   NICHT GANZ DEN ZWANG LOSWIRD, BEIM NACHDENKEN DAS, WAS IHM GESAGT
74002015   WIRD, AUF SEINE /5/RICHTIGKEIT/5/ ZU UEBERPRUEFEN.
74002016
74003001   ALLES DAS ABER LAEUFT IM LESER ALS /5/BEWUSSTSEIN/5/ AB, ALSO
74003002   DORT, WO /5/ER SELBST/5/ ZU HAUSE IST. WAS BEWUSSTSEIN IST, KANN
74003003   MAN NICHT NAEHER UMSCHREIBEN. ES GIBT KEINE BESCHREIBUNGSMITTEL
74003004   FUER ETWAS, DAS SELBER EINER JEDEN BESCHREIBUNG ALLER DINGE
74003005   VORAUSGEHT. ALLES, WAS WIR BESCHREIBEN, SIND VORGAENGE, DIE IHRE
74003006   SPUR VORHER IN UNSER BEWUSSTSEIN EINGEGRABEN HABEN.
74003007
74004001   WENN WIR EINEN AUGENBLICK UNSERE AUFMERKSAMKEIT IM ZIMMER
74004002   UMHERWANDERN LASSEN, IN DEM WIR SITZEN/1/ VIELLEICHT HOEREN WIR
74004003   JETZT EINE UHR TICKEN, EIN GLOCKENTON MAG VON AUSSEN AN UNSER OHR
74004004   DRINGEN, ODER EIN KIND PLAPPERT VOR SICH HIN ... WOVON WIR VORHER
74004005   NICHTS WAHRGENOMMEN HABEN. WENN WIR AUFMERKSAME LESER SIND,
74004006   VERGESSEN WIR ALLES UM UNS HERUM, VIELLEICHT NICHT IMMER BEI EINEM
74004007   WISSENSCHAFTLICHEN TEXT WIE DIESEM, BEI DEM SO VIEL KONZENTRATION
74004008   ZU VIEL VERLANGT WAERE. WER ABER KENNT NICHT DEN LESER DES
74004009   KRIMINALROMANS, DER IN SICH VERSUNKEN DIE WELT
74004010   VERGISST ... SOGAR DAS DONNERN DER UNTERGRUNDBAHN, DIE ER BENUTZEN
74004011   WILL UND DIE NUN DEM ERSCHRECKT AUFFAHRENDEN BEREITS
74004012   DAVONGEFAHREN IST.
74004013
74005001   DIESE KURZE GEMEINSAME UEBERLEGUNG IST EINE ART EXPERIMENT MIT
74005002   UNS SELBST GEWESEN, UM DREI BEGRIFFE ZU KLAEREN/1/ BEWUSSTSEIN,

CORPUS DISPLAY

74005003   ALSO DAS, WAS WIR IN UNS UNMITTELBAR VORFINDEN/2/ AUFMERKSAMKEIT
74005004   ALS EIN WORT FUER EINE UNS ZUNAECHST UNERKLAERLICHE KRAFT, DIE
74005005   UNSER BEWUSSTSEIN VON DEN MEISTEN GEGENSTAENDEN UNSERER UMWELT
74005006   WEGZIEHT UND EINEM EINZIGEN VORGANG ZUWENDET/2/ ENDLICH DINGE, DIE
74005007   ZWAR UNSERE SINNESORGANE TREFFEN (GERAEUSCHE Z.B.), VON DIESEN AUCH
74005008   MELDUNGEN IN DAS GEHIRN SCHICKEN, WIE WIR SICHER WISSEN, DOCH IN
74005009   UNSEREM GEHIRN NICHT IN DAS BEWUSSTSEIN DRINGEN, ALSO UNBEWUSST
74005010   VERBLEIBEN. SIE ENTGEHEN UNSERER AUFMERKSAMKEIT, HINTERLASSEN ABER
74005011   DOCH IHRE SPUREN, DENN NACHTRAEGLICH NACH DEM BEFRAGT, WAS WAEHREND
74005012   DER LEKTUERE DES KRIMINALROMANS UM UNSEREN VERTIEFTEN LESER VOR
74005013   SICH GING, WIRD ER SICH AN MANCHES ERINNERN, WENN AUCH UNDEUTLICH.
74005014   IN EINER HYPNOSE LASSEN SICH SOLCHE ERINNERUNGSSPUREN UNTER
74005015   UMSTAENDEN NOCH WEITER ERHELLEN UND INS LICHT DES BEWUSSTSEINS
74005016   HEBEN.
74005017
74006001   BEWUSSTSEIN IST ALSO ... VON INNEN GESEHEN ... ETWAS, DAS AN
74006002   EINEN STROM VON ERREGUNGEN GEBUNDEN, AUS SINNESORGANEN UEBER NERVEN
74006003   IN ZENTRALNERVOESE STRUKTUREN EILEND, HIE UND DA AUFBLITZT, VON
74006004   EINEM TEILE DIESES STROMES BESITZ ERGREIFT UND JE NACH DER RICHTUNG
74006005   DER AUFMERKSAMKEIT BALD HIER BALD DORT ETWAS /5/WAHRNIMMT/5/.
74006006   /5/WAHRNEHMEN/5/ HAT MIT /5/NEHMEN/5/ ZU TUN UND DRUECKT EINEN
74006007   AKTIVEN ANTEIL UNSERES ICH AN DER AUSWAHL AUS DER SUMME MOEGLICHER
74006008   ERFAHRUNGEN AUS.
74006009

ENGLISH CORPUS DISPLAY

CORPUS DISPLAY

HUMAN TRANSLATION

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74001001    THE ONLY BODILY CONDITIONS UNDER WHICH CONSCIOUSNESS IS POSSIBLE
74001002    ARE QUITE DIVERSE AND THE PROBLEM OF CONNECTING THE PSYCHIC WITH
74001C03    THE STRUCTURE OF OUR BRAIN IS SO COMPLEX THAT IN AN ESSAY ONE CAN
74001C04    ONLY SELECT A PARTIAL PROBLEM. THE SUBJECT TO BE CONSIDERED HERE
74001005    REPRESENTS (IN MY OPINION) THE MOST ESSENTIAL PROBLEM OF A
74001006    DEPENDENCE OF MENTAL PROCESSES ON THE BODY.
74001C07


74002001    I.
74002002    THE CONDITION OF THE READER/6/S BRAIN AT THIS MOMENT WHEN HE HAS
74002C03    DECIDED TO CONSIDER WITH THE AUTHOR SUCH A COMPLICATED SUBJECT IS
74002004    THAT OF WAKEFUL ATTENTIVENESS. IN IT, I.E. IN THAT PART OF HIS
74002005    PERSON WHICH HE CALLS HIS /5/EGO/5/ AND WHICH AT THIS MOMENT IS
74002006    OPEN TO HIS SELF-OBSERVATION, HE NOW DISCOVERS A SERIES OF
74002007    REFLECTIONS, WHICH ARE PARTLY IDENTICAL WITH THE AUTHOR/6/S
74002008    REFLECTIONS AT THE TIME THIS ESSAY WAS WRITTEN. PARTLY, HIS
74002009    THOUGHTS DIFFER A LITTLE FROM THE AUTHOR/6/S, WHICH IS
74002010    UNDERSTANDABLE MERELY THROUGH THE FACT THAT THE AUTHOR PRODUCED
74002011    THESE THOUGHTS, AND FURTHERMORE CONSIDERS THEM CORRECT, WHILE THE
74002012    READER IS THE RECEIVING PARTY AND THEREFORE THE /5/MEDITATOR,/5/
74002013    AND, HOPEFULLY, DOES NOT IN THE PROCESS LOSE THE COMPULSION TO
74002014    EXAMINE WHAT HE IS BEING TOLD AS TO ITS CORRECTNESS.
74002015


74003001    ALL THIS, HOWEVER, PROCEEDS IN THE READER AS /5/CONSCIOUSNESS,/5/
74003C02    I.E. IN THAT AREA WHERE /5/HE HIMSELF/5/ IS AT HOME. [WHAT
74003003    CONSCIOUSNESS IS, ONE CANNOT FURTHER CIRCUMSCRIBE.] THERE IS NO
74003004    MEANS OF DESCRIPTION FOR SOMETHING WHICH ITSELF PRECEDES ANY
74003C05    DESCRIPTION OF ALL THINGS. EVERYTHING WE DESCRIBE CONSISTS OF
74003C06    PROCESSES WHICH HAVE FIRST ENGRAVED THEIR TRACES IN OUR
74003C07    CONSCIOUSNESS.
74003008


74004001    IF WE LET OUR ATTENTION ROAM ABOUT FOR A MOMENT IN THE ROOM IN
74004002    WHICH WE ARE SITTING/1/ MAYBE WE NOW HEAR THE TICKING OF A CLOCK,
74004003    THE PEAL OF A BELL MAY REACH OUR EARS FROM OUTSIDE, OR A CHILD
74004004    BABBLES TO HIMSELF ... NOTHING OF WHICH WE PERCEIVED EARLIER. IF WE
74004005    ARE ATTENTIVE READERS, WE WILL FORGET EVERYTHING AROUND US, MAYBE
74004006    NOT ALWAYS WITH A SCIENTIFIC TEXT LIKE THIS ONE, WHERE SUCH
74004007    CONCENTRATION WOULD BE TOO MUCH TO EXPECT. BUT WHO DOES NOT KNOW
74004C08    THE READER OF A DETECTIVE STORY WHO, LOST IN HIMSELF, FORGETS THE
74004009    WORLD ... EVEN THE THUNDER OF THE SUBWAY WHICH HE WANTED TO TAKE
74004010    AND WHICH NOW THE STARTLED READER, JUMPING UP, HAS ALREADY MISSED.
74004011


74005001    THIS SHORT JOINT REFLECTION HAS BEEN A KIND OF EXPERIMENT WITH
74005002    OURSELVES IN ORDER TO CLARIFY THREE CONCEPTS/1/ CONSCIOUSNESS,
74005C03    I.E. THAT WHICH WE FIND DIRECTLY IN OURSELVES/2/ ATTENTIVENESS AS
74005C04    A TERM FOR A FORCE WHICH IS AT FIRST INEXPLICABLE, WHICH DRAWS
74005005    AWAY OUR CONSCIOUSNESS FROM MOST OBJECTS OF OUR ENVIRONMENT AND
74005006    DIRECTS IT TOWARD A SINGLE PROCESS/2/ FINALLY, THINGS WHICH MEET
74005C07    OUR SENSE ORGANS (E.G. NOISES) AND, AS WE DEFINITELY KNOW, SEND
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CORPUS DISPLAY

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74005008    REPORTS FROM THEM TO OUR BRAIN, BUT DO NOT PENETRATE INTO
74005C09    CONSCIOUSNESS WITHIN OUR BRAIN, AND THUS REMAIN UNCONSCIOUS.
74005010    THEY ESCAPE OUR ATTENTION BUT LEAVE THEIR TRACES, FOR IF ASKED
74005011    SUBSEQUENTLY ABOUT THAT WHICH TOOK PLACE AROUND OUR ABSORBED
74005012    READER WHILE HE WAS READING THE DETECTIVE STORY, HE WILL REMEMBER
74005013    SOME THINGS, IF ONLY DIMLY SO. IN CERTAIN CASES SUCH MEMORY TRACES
74005014    MAY BE ILLUMINATED EVEN FURTHER UNDER HYPNOSIS AND MAY BE RAISED
74005015    INTO THE LIGHT OF CONSCIOUSNESS.
74005C16


74006001    CONSCIOUSNESS ... SEEN FROM WITHIN ... IS THUS SOMETHING TIED TO A
74006002    STREAM OF STIMULI, WHICH RUSHES FROM OUR SENSES BY WAY OF OUR
74006C03    NERVES INTO CENTRAL NERVOUS STRUCTURES, LIGHTS UP HERE AND THERE,
74006004    TAKES POSSESSION OF A PART OF THIS STREAM AND, DEPENDING ON THE
74006005    PARTICULAR DIRECTION OF THE ATTENTIVENESS, PERCEIVES SOMETHING HERE
74006006    AND THERE. /5/TO PERCEIVE/5/ HAS TO DO WITH /5/TO TAKE,/5/ AND
74006007    EXPRESSES AN ACTIVE INTEREST OF OUR EGO IN SELECTING FROM THE SUM
74006008    OF POSSIBLE EXPERIENCES.
74006009
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FINAL DISPLAY *FIRST LRC MT OUTPUT 13 JAN 65*

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74000001   74UEBER THE PHYSIOLOGISCHE GRUNDBEDINGUNG DES CONSCIOUSNESSS (
74000002   ESSAY VON PROF. DR. HANS SCHAEFER,UNIVERSITAET HEIDELBERG,  IN/1/
74000003   /5/UNIVERSITAS/5/,CKTOBER 1959, 14. JAHRGANG, HEFT 10,SEITE
74000004   1079-1090)

74001001       THE  BODYEN BEDINGUNGEN, UNTER DENEN MERELY  CONSCIOUSNESS
74001002   POSSIBLE IST, SIND RECHT DIVERSE, THE   PROBLEM   THE KOPPLUNG VON
74001003   PSYCHICEMAN THE  STRUCTUR  WE BRAINS SO  COMPLEXT, DASS IN  AN
74001004   ESSAY  ONLY  A PARTIAL PROBLEM   SELECT WERDEN CAN.WAS HERE
74001005   CONSIDERT WERDEN SOLL, STELLT THE TWIE ICH GLAUBE) ESSENTIALSTE
74001006   PROBLEM EINER  BODYEN BEDINGTHEIT MENTALER PROCESSE DAR.

74002001       I THE ZUSTAND, DEN THE  BRAIN  THE  READERS IN  THESE  MOMENT
74002002   AUFWEIST, WO HE  DECIDED HAT, EIN SO  COMPLICATED  SUBJECT A MIT
74002003   THE   AUTHOR GEMEINSAM ZU BETRACHTEN, IST DER EINER WAKEFULEN
74002004   ATTENTION. IN  IT ... D.H. IN DEMJENIGEN TEIL ITER PERSON, DEN HE
74002005   IT  /5/ EGO/5/  CALLT UND DER ITER SELF-OBSERVATION  IN  THESE
74002006   MOMENT OFFENLIEGT, FINDET HE  NOW EINE SERIES VON UEBERLEGUNGEN
74002007   VOR, DIE PARTLY MIT DEM GLEICH SIND, WAS THE  AUTHOR ZUR ZEIT THE
74002008   WRITT  THESE  ESSAYES AUCH REFLECTIONTE. PARTLY WEICHEN ITE
74002009   THOUGHTN VON DENEN THE   AUTHORS A LITTLE AB, WAS MERELY DADURCH
74002010   UNDERSTANDABL IST, DASS THE  AUTHOR  THESE   THOUGHTN PRODUCTE,
74002011   FURTHERMORE  FOR   CORRECT HAELT, THE  READER DAGEGEN THE /5/
74002012   MEDITATORE /5/, WEIL EMPFANGENDE IST UND DABEI HOPEFULLY NICHT
74002013   GANZ THE  COMPULSION LOSWIRD, BEIM NACHDENKEN DAS, WAS IT GE
74002014   TOLDT WIRD, AUF ITE /5/ CORRECTNESS/5/ ZU UEBERPRUEFEN.

74003001       ALLES DAS ABER LAEUFT IN THE READER ALS /5/ CONSCIOUSNESS/5/ AB,
74003002   ALSO DORT, WO /5/ HE HIMSELF/5/ AT HOME IST.WAS CONSCIOUSNESS
74003003   IST, CAN   ONE NICHT  FURTHER  CIRCUMSCRIBEN.ES GIBT NO
74003004   BESCHREIBUNGSMITTEL FOR  SOMETHING, DAS SELBER EINER JEDEN
74003005   DESCRIPTION ALLER  THINGE PRECEDES.ALLES, WAS WE  DESCRIBEN, SIND
74003006   PROCESSE, DIE  THEIRE TRAC  FIRST  IN  WE  CONSCIOUSNESS
74003007   EINGEGRABEN HABEN.

74004001       WENN WE  FOR A MOMENT  WE  ATTENTION IM ROOM  ABOUT ROAMN LET,
74004002   IN DEM WE   SITTEN/1/ MAYBE  HEAREN WE  NOW  A CLOCK  TICKEN, EIN
74004003   GLOCKENTON MAY  FROM OUTSIDE AN OUR EARS DRINGEN, ODER A CHILD
74004004   BABBLT TO HIMSELF ... WOVON WE  FIRST  NOTHING WAHRGENOMMEN
74004005   HABEN.WENN WE  ATTENTIVEE READER SIND,  FORGETEN WE ALLES UM UNS
74004006   HERUM, MAYBE  NOT ALWAYS  WITH EINEM  SCIENTIFICEN TEXT WIE
74004007   THESE, WITH DEM SUCH CONCENTRATION ZU VIEL VERLANGT WAERE.WER
74004008   ABER KNOWT NICHT THE  READER  THE  DETECTIVE STORYS, DER  IN SICH
74004009   VERSUNKEN THE  WORLD  FORGETT ... EVEN  THE  THUNDER  THE
74004010   SUBWAY, DIE HE BENUTZEN WILL UND THE  NOW  THE  STARTLT JUMPING
74004011   UPEN ALREADY DAVONGEFAHREN IST.

74005001       THESE KURZE GEMEINSAME UEBERLEGUNG IST EINE ART EXPERIMENT MIT
74005002   UNS SELBST GEWESEN, UM DREI BEGRIFFE ZU KLAEREN/1/
74005003   CONSCIOUSNESS, ALSO DAS, WAS WE IN UNS UNMITTELBAR VORFINDEN/2/
74005004   ATTENTION ALS EIN WORT FOR EINE UNS ZUNAECHST UNERKLAERLICHE
74005005   KRAFT, DIE WE  CONSCIOUSNESS VON THE MEISTEN GEGENSTAENDEN
74005006   UNSERER UMWELT WEGZIEHT UND EINEM EINZIGEN VORGANG ZUWENDET/2/
74005007   ENDLICH THINGE, DIE ZWAR WE SINNESORGANE TREFFEN (GERAEUSCHE

74005008   Z.B.), VON DIESEN AUCH MELDUNGEN  IN  THE  BRAIN SCHICKEN, WIE WE
74005009   SICHER WISSEN, DOCH IN UNSEREM BRAIN NICHT  IN  THE
74005010   CONSCIOUSNESS DRINGEN, ALSO UNBEWUSST VERBLEIBEN.SIE ENTGEHEN
74005011   UNSERER ATTENTION, HINTERLASSEN ABER DOCH  THEIRE TRACEN, DENN
74005012   NACHTRAEGLICH NACH DEM BEFRAGT, WAS WAEHREND THE LEKTUERE THE
74005013   DETECTIVE STORYS UM UNSEREN VERTIEFTEN READER VOR SICH GING, WIRD
74005014   HE SICH AN MANCHES ERINNERN, WENN AUCH UNDEUTLICH. IN EINER
74005015   HYPNOSELASSEN SICH SOLCHE ERINNERUNGSSPUREN UNTER UMSTAENDEN NOCH
74005016   WEITER ERHELLEN UND INS LICHT THE  CONSCIOUSNESSS HEBEN.
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FINAL DISPLAY   MACHINE TRANSLATION OUTPUT

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74000001      74   THE PHYSIOLOGICAL BASIS OF CONSCIOUSNESS  (ESSAY BY PROF.
74000002    DR. HANS SCHAEFER, UNIVERSITY OF HEIDELBERG, IN/1/ UNIVERSITAS,
74000003    OCTOBER 1959, VOLUME 14, NUMBER 10, PAGES 1079 - 1090.)

74001001      THE ONLY BODILY CONDITIONS UNDER WHICH CONSCIOUSNESS IS
74001002    POSSIBLE ARE QUITE DIVERSE AND THE PROBLEM OF CONNECTING THE
74001003    PSYCHIC WITH THE STRUCTURE OF OUR BRAIN IS SO COMPLEX THAT IN AN
74001004    ESSAY ONE CAN ONLY SELECT A PARTIAL PROBLEM.  THE SUBJECT TO BE
74001005    CONSIDERED HERE REPRESENTS (IN MY OPINION) THE MOST ESSENTIAL
74001006    PROBLEM OF A PHYSICAL DEPENDENCE OF MENTAL PROCESSES.

74002001      I   THE CONDITION OF THE READER/6/S BRAIN AT THIS MOMENT WHEN IT
74002002    HAS DECIDED TO CONSIDER WITH THE AUTHOR SUCH A COMPLICATED
74002003    SUBJECT IS THAT OF WAKEFUL ATTENTIVENESS.  IN IT, I.E. IN THAT
74002004    PART OF ITS PERSON WHICH IT CALLS ITS /5/EGO/5/ AND WHICH AT THIS
74002005    MOMENT IS OPEN TO ITS SELF-OBSERVATION, IT NOW DISCOVERS A SERIES
74002006    OF REFLECTIONS, WHICH ARE PARTLY IDENTICAL WITH THE AUTHOR/6/S
74002007    REFLECTIONS AT THE TIME WHEN THIS ESSAY WAS WRITTEN.  PARTLY, ITS
74002008    THOUGHTS DIFFER A LITTLE FROM THE AUTHOR/6/S, WHICH IS
74002009    UNDERSTANDABLE MERELY THROUGH THE FACT THAT THE AUTHOR PRODUCED
74002010    THESE THOUGHTS, AND FURTHERMORE CONSIDERS THEM CORRECT, WHILE THE
74002011    READER IS THE RECEIVING PARTY AND THEREFORE THE /5/MEDITATOR,/5/
74002012    AND, HOPEFULLY, DOES NOT IN THE PROCESS LOSE THE COMPULSION TO
74002013    EXAMINE WHAT HE IS BEING TOLD AS TO ITS CORRECTNESS.

74003001      ALL THIS, HOWEVER, PROCEEDS IN THE READER AS
74003002    /5/CONSCIOUSNESS,/5/ I.E. IN THAT AREA WHERE /5/HE HIMSELF/5/ IS
74003003    AT HOME.  WHAT CONSCIOUSNESS IS, ONE CANNOT FURTHER
74003004    CIRCUMSCRIBE.  THERE IS NO MEANS OF DESCRIPTION FOR SOMETHING
74003005    WHICH ITSELF PRECEDES ANY DESCRIPTION OF ALL THINGS.  EVERYTHING
74003006    WE DESCRIBE CONSISTS OF PROCESSES WHICH HAVE FIRST ENGRAVED ITS
74003007    TRACES IN OUR CONSCIOUSNESS.

74004001      IF WE LET OUR ATTENTION ROAM ABOUT FOR A MOMENT IN THE ROOM IN
74004002    WHICH WE ARE SITTING/1/ MAYBE WE NOW HEAR THE TICKING OF A CLOCK,
74004003    THE PEAL OF A BELL MAY REACH OUR EARS FROM OUTSIDE, OR A CHILD
74004004    BABBLES TO HIMSELF ... NOTHING OF WHICH WE PERCEIVED EARLIER.  IF
74004005    WE ARE ATTENTIVE READERS, WE WILL FORGET EVERYTHING AROUND US,
74004006    MAYBE NOT ALWAYS WITH A SCIENTIFIC TEXT LIKE THIS ONE, WHERE SUCH
74004007    CONCENTRATION WOULD BE TOO MUCH TO EXPECT.  BUT WHO DOES NOT KNOW
74004008    THE READER OF A DETECTIVE STORY WHO, LOST IN HIMSELF, FORGETS THE
74004009    WORLD ... EVEN THE THUNDER OF THE SUBWAY WHICH IT WANTED TO TAKE
74004010    AND WHICH NOW THE STARTLED READER, JUMPING UP, HAS ALREADY
74004011    MISSED.

74005001      THIS SHORT JOINT REFLECTION HAS BEEN A KIND OF EXPERIMENT WITH
74005002    US IN ORDER TO CLARIFY THREE CONCEPTS/1/ CONSCIOUSNESS, I.E. THAT
74005003    WHICH WE FIND DIRECTLY IN US/2/ ATTENTIVENESS AS A TERM FOR A
74005004    FORCE WHICH IS AT FIRST INEXPLICABLE WHICH DRAWS AWAY OUR
74005005    CONSCIOUSNESS FROM MOST OBJECTS OF OUR ENVIRONMENT AND DIRECTS IT
74005006    TOWARD A SINGLE PROCESS/2/ FINALLY, THINGS WHICH MEET OUR SENSE
74005007    ORGANS (E.G. NOISES) AND, AS WE DEFINITELY KNOW, SEND MESSAGES
74005008    FROM THEM TO OUR BRAIN, BUT DO NOT PENETRATE INTO CONSCIOUSNESS
74005009    IN OUR BRAIN, THUS REMAIN UNCONSCIOUS.  THEY ESCAPE OUR ATTENTION

74005010    BUT LEAVE ITS TRACES, FOR IF ASKED SUBSEQUENTLY ABOUT THAT WHICH
74005011    TOOK PLACE AROUND OUR ABSORBED READER WHILE HE WAS READING THE
74005012    DETECTIVE STORY, IT WILL REMEMBER SOME THINGS, IF ONLY DIMLY SO.
74005013    IN CERTAIN CASES SUCH MEMORY TRACES MAY BE ILLUMINATED EVEN
74005014    FURTHER UNDER HYPNOSIS AND MAY BE RAISED INTO THE LIGHT OF
74005015    CONSCIOUSNESS.

74006001      CONSCIOUSNESS ... SEEN FROM WITHIN ... IS THUS SOMETHING TIED
74006002    TO A STREAM OF STIMULI, WHICH RUSHES FROM OUR SENSES BY WAY OF
74006003    OUR NERVES IN CENTRAL NERVOUS STRUCTURES, LIGHTS UP HERE AND
74006004    THERE, TAKES POSSESSION OF A PART OF THIS STREAM AND, DEPENDING
74006005    ON THE PARTICULAR DIRECTION OF THE ATTENTIVENESS, PERCEIVES
74006006    SOMETHING HERE AND THERE.  /5/TO PERCEIVE/5/ HAS TO DO WITH /5/TO
74006007    TAKE,/5/ AND EXPRESSES AN ACTIVE INTEREST OF OUR EGO IN SELECTING
74006008    FROM THE SUM OF POSSIBLE EXPERIENCES.
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APPENDIX E

Rules Used in Figure 1 (German)

SNTNC → CLS + .

CLS → CLS/S-O-R + , + PRDCT/D1/ACSTV

CLS/S-O-R → was + PRDCT/D2/3

PRDCT/D2/3 → NO/NTR/NDA + ist

NO/NTR/NDA → N1OW

N1OW → Bewusstsein

PRDCT/D1/ACSTV → PRDCT/D1/INF + INF/PHRS/ACSTV

PRDCT/D1/INF → MDL/3 + PRN/3

MDL/3 → kann

PRN/3 → man

INF/PHRS/ACSTV → nicht + INF/PHRS/ACSTV

INF/PHRS/ACSTV → ADV + INF/ACSTV

ADV → A1A + er

A1A → naeh

INF/ACSTV → V12A + en

V12A → umschreib

APPENDIX E (Continued)

Rules Used in Figure 2 (English)

SNTNC → CLS + .

CLS → CLS/SBSTNT + , + CLS

CLS/SBSTNT → what + BE/SNGLR/PRSNT

BE/SNGLR/PRSNT → NMNL/A/' + is

NMNL/A/' → N5F

N5F → consciousness

CLS → PRN/SS + VRBL/MDL/PHRS

PRN/SS → one

VRBL/MDL/PHRS → MDL + VRBL/PHRS

PRN/SS → one

VRBL/MDL/PHRS → MDL + VRBL/PHRS

MDL → cannot

VRBL/PHRS → ADVB/A + VRBL

ADVB/A → further

VRBL → VPR1A + e

VPR1A → circumscrib