The autonomy of syntax

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Knowledge in Ferment

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Dilemmas in Science, Scholarship and Society

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Preface

Dilemmas, fundamental controversies, basic oppositions between methods and approaches, occur in all fields of science and scholarship. Often dilemmas arise at the interface where science and society meet, or whenever several sciences or disciplines clash. The paradox of dilemmas is that although one might prefer to do without them, they are nevertheless indispensable. Without dilemmas progress in science and scholarship would be unthinkable. New paradigms come into existence and compete with the old for acceptance. Thus, by inciting researchers to make new efforts and pose new questions, dilemmas reveal new insights and sustain the ferment of knowledge.

As the Rector Magnificus of Leiden University for six years, from 2001 to 2007, Professor Douwe Breimer devoted his great talents and his best endeavours to developing and improving teaching and research inside and outside Leiden. As Professor of Pharmacology in Leiden from 1975, of Pharmacology and Pharmacotherapy from 1981, Breimer was the architect of, first, the Center for Biopharmaceutical Sciences (1983), then the Center for Human Drug Research (1987) and finally the research school, the Leiden/Amsterdam Center for Drug Research (1992). In 1984 he became Dean of the Faculty of Mathematics and Natural Sciences. Breimer's meritorious services to scientific research and to the organisation and development of science have been recognised in the seven honorary doctorates which he has received from universities all

over the world. But as Rector Magnificus, Douwe Breimer has been much more than the champion of the natural and life sciences, for he has also upheld Leiden's pre-eminence in the humanities, jurisprudence and the social and behavioural sciences. As a scientist, an administrator and especially as Rector Magnificus Breimer has been accustomed to act with circumspection, but also with decisive vigour. He has always shown himself to be one of the *esprits préparés* of Louis Pasteur's dictum, 'Le hasard ne favorise que les esprits préparés', a saying very dear to his heart. But he is also the embodiment of a proverb in his own mother-tongue, Frisian, 'Sizzen is neat, mar dwaen is in ding' (talk is nothing, but doing is something). He always was, and is, a man with style.

During his rectorship Douwe Breimer has enjoyed the deep respect and warm sympathy of the whole University. The University continues to regard him with pride and admiration. On his retirement as Rector Magnificus his friends and colleagues wished to demonstrate their gratitude by offering him this volume of studies. They have chosen as its theme 'Knowledge in ferment: dilemmas in science, scholarship and society'. In the word 'ferment' one may detect an allusion to a phenomenon in Breimer's own field of study; but it also refers to the catalytic role that dilemmas play in the development of science and scholarship. Colleagues from all Faculties and many departments of the University have contributed with enthusiasm to this volume. Authors and editors offer it to Douwe Breimer as a tribute of their gratitude, respect and friendship.

Leiden, 8 February 2007

Adriaan in 't Groen
Henk Jan de Jonge
Eduard Klasen
Hilje Papma
Piet van Slooten
Editors

To Douwe Breimer

on the occasion of his retirement as Rector Magnificus
of Leiden University
after a six-year term of office (2001-2007).
During these years he has inspired the University through
the example of his exceptional scientific achievements and his ideal
of the university
as promoter of welfare, well-being and culture.

He has exercised his office with unflagging energy, uncontested authority,
a rigorous insistence on the highest academic standards,
the wisdom of his judgement and experience,
his profound humanity
and grand style.

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The autonomy of syntax

Lisa Lai-Shen Cheng

One of the most often discussed and disputed hypotheses in linguistics since the time of American structural linguistics concerns the independence of grammar (or formal processes), more precisely, the 'autonomy of syntax hypothesis', which, according to Croft is:

> '… the hypothesis that the syntactic component of the grammar is independent, (largely) systematic and (largely) self-contained with respect to the semantic, pragmatic and/or discourse-functional components'. [1]

Broadly speaking, the basic claim is that formal syntactic processes of grammar are independent of other parts of grammar, such as semantics (governing interpretation), phonology (sound), and the rest of the linguistic system. The claim is usually disputed since to most of us it is obvious that when we use language, we do not separate sentence structure and interpretation, and then we are not even mentioning the fact that pragmatic and social factors play a role in determining the use of the language.

In this article, I provide an overview of the debate centring around the autonomy of syntax hypothesis. I first discuss a particular syntactic phenomenon to demonstrate what the proponents of the hypothesis have in mind. I then discuss objections, which are based on the fact that (a) syntax clearly interacts with other systems, and (b) languages change

(including their syntax). I then proceed to review results from child language acquisition studies, as well as psycholinguistic and neurolinguistic studies. In other words, I introduce interdisciplinary material for (re)-evaluation of the hypothesis. Though not all results in these studies should be taken at face-value, it is clear that the field of linguistics has advanced to the extent that theoretical research and interdisciplinary studies can better inform each other, which may help settle some old disputes.

Background

To appreciate the issues involved in the autonomy of syntax debate, it is necessary to understand what syntacticians mean when they talk about syntactic processes. A good example of a syntactic process is verb movement. It is generally assumed that in the derivation of a sentence, words or constituents may be generated in one place in the structure and surface in another; we say that the element in question has moved from one place to the other. For example, in (1a), *John* occupies the first position in the sentence, but it is also interpreted as the object of *like*; since in English the canonical object position is the position immediately behind the verb as shown in (1b) (in other words, English is 'VO'), we assume that that is the original position of *John* in (1a) and that it reached sentence initial position by way of movement, as shown in (1c).

(1) a. John, I don't like.
b. I don't like John.
c. ____ [I don't like John]

Verbs also move, as can be shown by looking at the Verb Second phenomenon (henceforth 'V2') in Germanic languages such as Frisian, Dutch and German. Unlike English, which is VO as we just saw, these languages are OV, which means that the canonical position of the object is immediately before the verb.[2] The following examples from Frisian and Dutch make this clear.

(2) a.	Jan seit dat er	in âlde freon	seach.	[Frisian]
	Jan zegt dat hij	een oude vriend	zag.	[Dutch]
	Jan says that he	an old friend	saw	

'Jan says that he saw an old friend'.

b.	Jan wol	in âlde freon	sjen.	[Frisian]
	Jan wil	een oude vriend	zien.	[Dutch]
	Jan want	an old friend	see	
	'Jan wants to see an old friend'.			
c.	Jan hat	in âlde freon	sjoen.	[Frisian]
	Jan heeft	een oude vriend	gezien.	[Dutch]
	Jan has	an old friend seen		
	'Jan has seen an old friend'.			

In these sentences, the constituent *in âlde freon/een oude vriend* 'an old friend' is the object of the different forms of the verb *sjen/zien* 'to see': past tense *seach/zag*, infinitive *sjen/zien* and past participle *sjoen/gezien*. In all these cases, *in âlde freon/een oude vriend* appears in front of the verb of which it is the object; thus we conclude that Frisian and Dutch are OV. In Frisian, Dutch and German, the object appears to the right of the verb it is the object of in one context only, *viz.*, in main clauses with just one verb:

(3)	Jan seach in âlde freon.	[Frisian]
	Jan zag een oude vriend.	[Dutch]
	Jan saw an old friend.	

It is generally acknowledged that in such cases the verb has moved from its position at the end of the sentence to the second position. This can be stated in more general terms. Dutch and Frisian (and German) require that the finite (or 'inflected') verb (that is, the verb that agrees with the subject) of a sentence appears in the second position of the sentence, leaving the non-finite verbs, such as past participles and infinitives, in final position, as we saw in (2a-c) and see again, illustrated in Dutch, in (4a,b) and (5a).

(4) a. Piet heeft veel boeken gelezen.
Piet has many books read
'Piet has read many books'.

b. Dit boek heeft Piet een paar keer gelezen.
this book has Piet a few time read
'This book, Piet has read it a few times'.

(5) a. Morgen moet Jan een praatje geven.
tomorrow must Jan a talk give
'Jan must give a talk tomorrow'.

b. In Leiden hebben wij feest op 3 oktober.
in Leiden have we celebration on 3 October
'We have a celebration on October 3rd in Leiden'.

Aside from showing that the finite verb is always the second constituent in the sentence, these examples also show that it is in second position regardless of what constituent appears in the first position: it can be an agentive subject (4a), an object (4b), a temporal adverb (5a) and a prepositional phrase (5b).

Since den Besten's book,[3] it has been generally assumed that the inflected verb in V2 clauses has moved to a position immediately above the core sentence. In (5a) for instance, the modal verb *moet* 'must' has moved past the subject, which can be considered to define the sentence boundary, as shown in the derivation of (5a) in (6).

(6) Derivation: [morgen ____ [$_s$ Jan een praatje moet geven]]

In other words, the derivation of every V2 clause involves a syntactic process, namely verb movement. What is crucial to the argument is that verb movement in V2 sentences is a process that is on the one hand obligatory and on the other entirely independent of any phonological or interpretational considerations. With respect to the phonology, any verb with any phonological make up can move to the V2 position (as long as it is inflected), which means that its own phonological characteristics play no role. It is equally independent of what type of phonological material appears in the first position. As for interpretational considerations, no interpretational effect is associated with the movement of the verb to the V2 position and what appears in the first position can be interpreted as a topic as in (1a), (4b) and (5a,b) or an informational focus as in information questions such as (7a,b). In other words, the verb must be moving to the V2 position for purely syntactic reasons. Its movement must be triggered by considerations of a purely syntactic nature.

(7) a. Wat wil Jan kopen in de winkel?

what will Jan buy in the shop
b. Wanneer komen ze hier?
when come they here
'When are they coming here?'

Since its application is in all respects independent of interpretation and phonology, the V2 verb movement operation is the type of formal process which has given rise to the claim that syntax is an autonomous system (see also Ref 3, section 3.5 in Chapter 3 for more discussion on evidence for the autonomy of syntax).[4]

Verb movement is one of the formal processes that syntacticians consider to be independent (to be autonomous). This does not mean to say that there are no syntactic operations that also have semantic ramifications, or that there are no syntactic operations that are triggered by semantic considerations (the movement of the topic to sentence initial position in (1a), (4b) and (5a,b) is an example). The main question is: if only a limited set of operations exist that are independent of other (interpretational, phonological) systems, is that enough to claim that syntax is autonomous and forms its own computational system?

The dispute: Against syntactic autonomy

As Croft points out,[1] the arguments against the autonomy of syntax claim can be divided into two types. The first type comes down to providing counter-examples to argue that the constraints and restrictions on certain syntactic operations are due to semantic, pragmatic or discourse-functional principles. Leaving aside whether the counter-examples in question are really counter-examples or not, this type of objection, as Croft also notes, does not constitute a principled threat to the autonomy claim, because it at best reduces the number of operations that can be viewed as autonomous. I will not discuss this type here.

The second type of argument forms a more serious challenge not only to syntactic autonomy, but also to the autonomy of the grammar as a self-contained system, according to Croft. That is, what is at stake is larger: is the linguistic knowledge of an individual a self-contained system or not? The more challenging arguments can be divided into two categories, which we deal with in the following two sections.

Interactions

First, many analyses can be called 'mixed' analyses in the sense that it can be argued that the syntactic operations involved in such analyses pay attention to semantic considerations. Consider for example the phenomenon of agreement. Subject-verb agreement is cross-linguistically very common, and syntacticians deal with it syntactically. However, in some languages, there are restrictions on agreement, which cannot be argued to be syntactic in nature. For instance, agreement may be restricted to certain persons/genders only. I illustrate this with Bemba, a Bantu language. Bemba, like all Bantu languages, has noun-classes (which are in some ways similar to a classifier system). The verbal sequence agrees with the subject in terms of noun classes. For instance, if the subject noun is class 1, the verb will show class 1 agreement, and if the subject noun is class 5, the verb will show class 5 agreement (in example (8a,b), the number in the gloss indicates the noun class, and SM indicates subject marking; data from Givón).[5]

(8) a. abaana ba-aliile
2child 2SM-left
'The children left'.
b. ili-ishilu li-aliile
this-5lunatic 5SM-left
'This lunatic left'.

There is one situation in which subject-verb agreement in Bemba shows 'leakage' to semantics. The regular subject-verb agreement for class 1 nouns in Bemba is the morpheme *a*, as illustrated in (9b), which contains a 'long' subject relative. In (9a) we see that in 'short' subject relatives, this morpheme is replaced (data from Cheng).[6]

(9) a. umulumendo ú-u-ka-belenga ibuku [Bemba]
1boy 1REL-1SM-FUT-read 5book
'the boy who will read the book'
b. n-ali-íshiba umwaana uo Peter a-léé-tóntonkanya (ati)
á-ilé mailo
I-TNS-know 1child 1DEM Peter 1SM-TNS-think
that 1SM-left yesterday
'I know the child who Peter thinks left yesterday'.

What is important is that this kind of 'replacement' agreement only happens with class 1 nouns, typically singular nouns that are not only animate but also human. In other words, the system of agreement has to pay attention to the noun class, or the 'human' factor, in the case of 'replacement' agreement. This can be interpreted as an argument that shows that syntax is not self-contained because non-syntactic information interacts with syntax.

Variation

There are two types of variation that are problematic to syntactic autonomy. The first type is variation in terms of language change (through time), and the other is variation in individual speakers in terms of language use (a speaker may use a certain phrasing in one (social) context and a different phrasing in another). This fact can be used to argue that the adult's grammar is inherently variable and dynamic, and is easily affected by external forces, such as social function.

Leaving aside the problems that Croft points out (e.g., how the dynamic processes should be represented cognitively), the fact that variation or change exists appears problematic for the autonomy of syntax claim because in such a model of variable dynamics, the syntactic system never achieves a fixed and final (adult-level) stage as it is constantly susceptible to social interaction.

The variation or change does not just relate to individual word changes. It also includes changes that are syntactic. Take English as a concrete example. Unlike Frisian, Dutch and German, Modern English is not a V2 language (though it has residual V2 in interrogative sentences such as *what will John buy*[7]); this is easily seen in sentences in (10).

(10) a. *This book has {read} Piet a few times {read}.
(Intended sentence: This book, Piet has read a few times).
b. *Tomorrow will {give} Jan a talk {give}.
(Intended sentence: Tomorrow, Jan will give a talk).
c. *In Leiden have we a celebration on October 3rd.
(Intended sentence: In Leiden, we have a celebration on October 3rd).

Old English, however, is like Frisian, German and Dutch. It exhibits full V2 properties:

(11) a. Se Hæland wear ð þa gelomlice ætiwed his leornung-cnihtum.[8]
the Lord was then frequently shown his disciples
'The Lord then frequently appeared to his disciples'.
b. On twam þingum hæfde God þaes mannes sawle gegodod.[9]
in two things had God this man's soul endowed
'With two things had God endowed the man's soul'.

Middle English still preserves consistent V2. English has apparently changed from V2 to residual V2, with only a limited amount of V2 properties remaining. The fact that English syntax/grammar has changed suggests that children may not have acquired English to a final/steady stage; a conclusion which is problematic for a formalist view of grammar. Further, language change of this kind appears incompatible with syntactic autonomy since some changes appear to be triggered by external forces.

The dispute: For syntactic autonomy

Interactions

The objection to the autonomy of syntax which hinges on the fact that the system interacts with other systems is based on the assumption that if a system is self-contained, it should not be susceptible to 'external' influences. This is a curious assumption, I think. In biology, there are many systems which are generally recognised as autonomous systems but clearly interact with other systems. Take the visual system, which is clearly a self-contained system. However, vision certainly interacts with other systems (such as recognition, emotion). We can even be tricked into seeing things we do not see when we are fed information through different means. Vision, nonetheless, remains a separate system.

The most important task for linguists, especially syntacticians, is to figure out how the system interacts with other systems, and to develop a theory of interaction, or 'mapping' as current syntactic theories call it. In particular, if syntax interacts with interpretation, how does it interact? How are syntactic representations mapped into semantic representations? Since each system has its own internal rules and constraints, it cannot be the case that mapping is unconstrained.

Note that if the so-called 'leakages' in syntax from other domains are due to interactions between systems, we make a clear-cut prediction. If something goes wrong in the domain of system interaction (see below on interdisciplinary perspectives), the systems themselves remain intact. In the case of Bemba subject-verb agreement, for example, such a model predicts that in cases of interaction failure or inaccessible interaction, the replacement phenomenon will manifest itself differently (e.g., not restricting to only class 1 nouns). However, it is only in rare occasions that we detect 'interaction failures' (see below).

Variation

The problems posed by language change and individual variation constitute interesting and serious problems for the autonomy of syntax or grammar hypothesis. Autonomist linguists who do research on language change have developed the following model to deal with this problem. They assume that each individual has acquired a grammar, which is by and large the same as that of the other members of their speech community; the 'by and large' is crucial: individual grammars are never entirely identical since children who are acquiring a language never have entirely identical linguistic input. In other words, this model claims that language change occurs during language acquisition.

However, this cannot be the whole story. Consider the loss of V2 that took place between Old English and Modern English. It is conceivable that at a particular stage before Modern English, some speakers had V2, while other did not, and a third group had both. Synchronically speaking, at that stage, the rule of V2 was optional. The question is how come some speakers 'feel free' not to use this rule, while others use it optionally and others do not use it at all? The questions that arise are (a) whether a self-contained system can be subject to 'internal' change, that is, without an external trigger; (b) if change is triggered externally, does that necessarily lead to the conclusion that the system is not self-contained?

A self-contained system which changes through 'internal' pressure is not problematic for the notion of the autonomy of grammar/syntax. It is more problematic for the notion that when children achieve an adult-like level of language, they have attained a steady state. But this is probably the same question that one can ask about any biological system which evolves. How come a certain system changes through time? To answer this question, we must also answer the question of how language evolves through time.

As for external triggers of change, it seems to be rather problematic for a self-contained system. It is possible to appeal to interactions with the external systems, in the sense that since the system is not closed off to the outside (because it interacts), it is conceivable that it is through the interactions, for example the mapping between syntax and pragmatics, that change is brought about. Kroch has argued for co-existing/competing grammars.[10] The idea is that individuals can possess two grammars at the same time. This solves the problem of optionality in the sense that it is not the rule that is optional, rather, there are in fact two grammars. However, the question still arises as to why there are two grammars. Is it the case that children somehow develop two grammars at the same time or is it the case that adults develop an additional grammar at a later stage?

Recent work in computational models of language change and language evolution shows that a dynamic formal system is compatible with internal and external change.[11] Following this line of work, the disagreement between the autonomists and the non-autonomists may be resolved.

Interdisciplinary perspectives

There is a large body of work done since the early 1980s on child language acquisition, psycholinguistics and neurolinguistics. These studies provide an interesting and important perspective to the debate discussed here. In studies on child language acquisition and aphasic speech, it is possible to detect patterns that we do not see in normal adult language. Children acquiring a language do not have the whole system in place, or the interactions between systems may not be fully functional. For aphasics, due to brain damage, certain parts of the system do not function well.

Language acquisition

To fully appreciate evidence from child language acquisition research, we must first understand that children at a very early age already have a sophisticated system in place, even if they still produce syntactic errors (errors, that is, from an adult point of view). I discuss here first a phenomenon called 'Optional Infinitives' that shows this. Then I briefly discuss two studies which suggest that syntax develops separately from interpretation, and in fact runs ahead of interpretation.

OPTIONAL INFINITIVES

We discussed above that some languages, for example, Frisian, Dutch and German, have V2 properties, with the verb appearing in second position in main clauses. Consider now data from child language acquisition. In early linguistic development (until about 3 years old), children acquiring Dutch and German go through an Optional Infinitive (OI) stage. At this stage, children use both finite and infinitival verbal forms in main clauses, as shown in (12) and (13) (examples from Wexler).[12]

(12) a. pappa schoenen wassen [infinitival verb]
daddy shoes wash
b. pappa kranten weg doen
daddy newspaper away do

(13) a. ik pak 't op [finite verb]
I pick it up
b. baby slaapt
baby sleeps

Note, however, that children are extremely consistent (99%) when it comes to correlating V2 and finite verbs. That is, if they use a finite verb form, the verb is fronted to the V2 position while the infinitival verb remains in final position (98%) (as the examples in (12) and (13) also show). The OI stage shows that despite the young age, they already have a system in place: they do not put infinitival verbs in the second position and they do not put finite verbs in final position. It may not be the whole adult system, but it is a system nonetheless.

LONG DISTANCE QUESTIONS

In languages like German, interrogative phrases can either undergo long distance movement, as illustrated in (14a), or move 'partially' to an embedded location, allowing the main clause to be marked by a dummy question word, as in (14b) (examples from Herburger).[13]

(14) a. Wen glaubt der Georg [dass die Rosa geküsst hat]?
[long distance movem't]
who believe George that Rosa kissed has

'Who does George believe that Rosa kissed?'

b. Was glaubt der Georg [wen [die Rosa geküsst hat]]?
[partial movement]
what believe George who Rosa kissed has
'Rosa kissed someone, who does George think it was?'

In (14a), the interrogative word *wen* moves from the embedded clause (marked by the square brackets in (14a) to the front of the main clause. In (14b), the interrogative word *wen* moves to a position in front of the subject of the embedded clause; and *was*, which is a dummy question word here, appears in the front of the main clause. Herburger shows that these two sentences differ in their interpretation, in particular in the presupposition. The partially moved question (14b) is not felicitous in a context where Rosa did not kiss anyone, while there is no such presupposition requirement for long distance questions such as (14a).

Demirdache and Oiry studied long distance questions and questions with partial movement in child language (with children ranging from 3 to 6 years of age) in French.[14] Put simply, they found that children produce both long distance questions and questions with partial movement. However, they also found that the children's production of these different types of questions is independent of the presupposition requirement. This means that children have both strategies of question formation in place, but they are as yet unassociated with interpretation (in this case a presuppositional requirement).

RELATIVE CLAUSES

The fact that children have trouble comprehending object relatives such as (15b) in contrast with subject relatives as in (15a) has long been documented.[15]

(15) a. the girl that is kissing the granny (is my sister) [subject relative]
b. the granny that the girl is kissing (is my granny) [object relative]

In (15a), *the girl* is the subject of the clause *is kissing the granny* (a relative clause, which modifies *the girl*), and in (15b), *the granny* is the object of the clause *the girl is kissing*. In a recent study on Hebrew child language (around 4 to 5 years old), Arnon replicates the results of comprehension asymmetry between subject and object relatives.[16] Children comprehend

subject relatives 95% of the time while object relatives yield a chance level result (51%). Interestingly, however, children produce correct subject and object relatives without any significant difference (88% subject relatives vs. 93% object relatives).

INTERPRETATION

Both child language experiments just discussed show that production runs ahead of comprehension: the children form both types of long distance question sentences and have no problem making both subject and object relatives. Forming these sentences correctly is a syntactic matter. At the same time, it is clear that the children do not have a full grasp of the meaning of the sentences they build correctly. This may be due to the fact that the comprehension part requires connection with another system and that either this system or the connection between syntax and this other system has not fully developed yet. In any case, there is an asymmetry between comprehension and production, which may lead to the conclusion that syntax is indeed a separate system.

Aphasics

There is an abundance of studies on aphasic patients, who have suffered brain damage in various regions of the brain. I review here very briefly two different case studies, which both point in the direction of there being a syntactic system (despite the brain-damage), though a semantic or a non-syntactic system is no longer accessible/usable.

TRANSCORTICAL SENSORY APHASIA

The first case is a case of transcortical sensory aphasia which provides support for the autonomy of syntax claim. Patients with transcortical sensory aphasia hardly produce any spontaneous speech, but they can repeat the questions and statements that their interlocutors say to them. In a case study by Dogil et al.[17], a German-speaking patient with transcortical sensory aphasia is investigated. The authors test the patient using sentences with syntactic errors (e.g., agreement errors) and sentences with semantic deviance (e.g., having the wrong type of verb), as shown in (16a) and (16b) respectively.

(16) a.	Der Junge	spiel-*en/-t	mit	dem Hund
	the boy	play-PL/3SG	with	the dog

b. #Der Schwan	schwimmt	auf dem Tee
the swan	is.swimming	on the tea

Dogil et al. show that in the case of agreement errors (for subject-verb agreement), the patient did not just repeat the sentence; the patient corrected the error as well (80% of the time); he hardly ever repeated the ungrammatical sentences verbatim. In contrast, sentences with semantic deviance are repeated verbatim (72% of the time, and in two sessions 87.5%); he hardly ever corrected the semantic deviance.

Studies of this kind show that the agreement system triggers a different response from a non-syntactic system. This can be interpreted as showing that the syntactic system operates separately from the non-syntactic system. In normal adults, the constant interactions between these systems make it difficult to tear apart the individual systems. In the case of brain-damaged patients, we get a glimpse of the individual systems, operating separately.

There are two possible reservations concerning the results in this study. First, one may argue that sentences such as (16b) are difficult to correct since it may be unclear as to what the interlocutor really means. However, it should be noted that there is a significant difference in terms of the responses – the patient did not even randomly attempt to correct semantic deviance. Second, the semantic deviance is basically a selectional restriction violation; while the sentences may be semantically deviant, it is not the case that they do not mean anything.

BROCA'S APHASIA

Broca's aphasia is a more common type of aphasia, with disfluent and effortful speech. Broca's aphasics are typically characterised as having a deficit in both production and comprehension. In a case study on a Broca's aphasic patient, Saddy shows that although the patient showed a severe comprehension deficit in 'act-out' tasks, he can provide correct grammaticality judgments on the same type of sentences.[18]

Concretely, the patient was asked to create a cartoon representation of the sentence that was read to him, with cards depicting individuals as well as events. The sentences ranged from simple active sentences, to passive sentences (17b) and sentences with subject/object relatives (17a). The patient performed poorly in these act-out tasks, as indicated by the percentages given.

(17) a. The friend who sprayed Rose is sad. [relative clauses: 17% correct]
b. Bill was sprayed by Ken. [passive sentences: 8% correct]

In contrast, the patient could provide rather good grammaticality judgments (something that has been noted before in aphasics research).[19] The patient was asked to distinguish between sentences that he could say (e.g., *The boy kissed the girl*) and sentences that he could not say (e.g., **girl kissed the boy the*). It was clear from the results that the patient correctly judged sentences such as (17a,b) to be sentences that he could say, even though he had trouble with these sentences in a comprehension task. Furthermore, the patient was also tested on complex sentences with long distance dependencies, such as the one in (18), in which *who* originates as the object of the preposition *of* and is fronted to the beginning of the sentence to form an interrogative.

(18) Who_i do you think Bill likes pictures of $\_\_\_i$?

Note that long distance dependencies do not always yield grammatical sentences. There are constraints and restrictions as to (a) the 'length' of the movement, and (b) the original position of the moved element. Interestingly, the patient under investigation provided correct grammaticality judgments for sentences with long distance dependencies. For example, he, correctly, judged sentences such as (18) to be grammatical, and the ones such as those in (19a,b) as ungrammatical.

(19) a. *Who_i do you think pictures of $\_\_\_i$ are on sale?
b. *Who_i do you like stories that criticize $\_\_\_i$?

In other words, though the patient had trouble with comprehending sentences such as (17a,b) (perhaps having trouble distinguishing which is the agent of the action, and which is the patient of the action), he had no trouble judging whether a sentence is a good sentence or a bad sentence. This suggests that the patient has access to grammatical structure and grammatical rules, allowing him to provide correct grammaticality judgments. The poor performance with comprehension tasks suggests that interactions with other systems are disturbed or damaged. An

interpretation for this can be that the syntactic system is autonomous.

Neurolinguistic research

Within the last ten years, due to technological advances, it is possible to study brain activity, including linguistic activity, more directly. Here I discuss two methods in neurolinguistic research which may have some bearing on the issue of the autonomy of syntax.

'EVENT-RELATED' fMRI FINDINGS

We can make recordings of brain activity with electrodes placed on the scalp, and the recordings can be 'time-locked' to specific events (for example, stimuli). These recordings offer very fine-grained temporal resolution, and they can help us identify different brain potentials associated with different temporal stages of processing.

In neurolinguistic research, there are currently two indexes which appear relevant to syntactic and semantic processing. The first is the so-called 'N400', which is a negative-going event-related potential or ERP, which peaks around 400 ms following the onset of an anomaly. The second is the 'P600', which is a positive-going ERP, which peaks around 600 ms after an anomaly. The N400 is typically linked to semantic incongruities (e.g., using the wrong word as in **I take my coffee with milk and concrete*), while the P600 is linked to syntactic violations such as word order and grammatical category violations (e.g., **The scientist criticised Max's of proof of the theorem*),[20] indicating syntactic processing costs.[21] Although it must be noted that the nature of the P600 is not entirely clear since it seems to be also related to reanalysis of structure in general (including musical structure), we can still conclude that semantic anomalies are registered differently from syntactic ones.

While ERP registers temporal resolution, the fMRI technique (functional magnetic resonance imaging) offers spatial resolution, which allows us to identify regions in the brain involved in linguistic processing. For example, the Broca's area (the left inferior frontal gyrus) has been repeatedly shown to be activated with linguistic activities such as reading, as well as judging grammatical and ungrammatical sentences.

In a study using a combined ERP-fMRI technique[19], researchers found that syntactic violations lead to activation of brain areas that are different from areas that are activated due to semantic violations, confirming the results of the ERP studies distinguishing syntactic and semantic anomalies.

Taken as a whole, the results support the autonomy of syntax in the sense that syntactic processing depends on different neurolinguistic processes from semantic processing, with activation of different brain regions.

I would, however, add a word of caution with respect to this interpretation. The syntactic violations used in typical ERP and fMRI studies are often apparently word order violations, e.g., sentences such as **Yesterday I cut Max's with apple caution* (instead of the well-formed *Yesterday I cut Max's apple with caution*). Such word order violations are different from violations of syntactic rules. That is, sentences with reversed word order of this kind are ungrammatical because of a compositional error – e.g., after *Max's*, we expect to have a noun phrase (e.g., *apple*) and not a preposition. Though it is related to syntax, it is possible to interpret the violations as more 'selectional' than purely structural (recall the purely structural properties of the operation moving the finite verb into the V2 position). In other words, experiments on syntactic processes are called for (and not just simple word order variations).

Conclusion

In conclusion, the dispute on the autonomy of syntax can perhaps be settled by introducing results from interdisciplinary research into the discussion, such as neurolinguistic and psycholinguistic studies on normal speakers, aphasics and child language. The studies I reviewed above seem to point into one direction (syntax is autonomous), but it must be acknowledged that only a small number of studies have been done that yield results which seem to bear on the issue. More research is necessary. As was pointed out above, another area of research that may produce results relevant to the debate is the area of language change and language evolution. In all, this presents a rather exciting prospect for the years to come.

Notes

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