

Instruments in LFG's Argument-structure

James Webb

Thesis for MPhil in General Linguistics & Comparative Philology

Submitted April 2008

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Acknowledgements

I would like to thank very much Mary Dalrymple for many extremely helpful discussions and critical comments, and also for her sound advice and continuous encouragement. Thanks to friends who gave their judgements on sentences and to the participants of the interview presented in Subsection 2.3.4. I would also like to thank the audience at LangUE 2008 for their questions and comments where part of this research was presented. Many thanks to my parents for all their support. I dedicate this thesis to Dylan.

Abbreviations

ACC	accusative case
L-OBJ	logical object
L-SUBJ	logical subject
NOM	nominative case
OBL _θ	oblique theta
OBL _{AG}	oblique agent
OBL _{INS}	oblique instrument
OBJ	object
p-a	proto-argument
p-p	proto-patient
p-r	proto-role
PST	past
SUBJ	subject
TOP	topic marker

1 Introduction

Instruments in a linguistic construction either enable or facilitate the action or event denoted by the verb phrase (VP), such as the underlined phrases in the examples below. In (1a), ‘the key’ enables Jack to open the door; and in (2a), ‘a fork’ facilitates Emily in devouring the pasta.

- (1) a. Jack opened the door with the key.
b. The key opened the door.
- (2) a. Emily devoured the pasta with a fork.
b. *The fork devoured the pasta.

Following the observation of a number of researchers that instruments subcategorize into two types, namely those that can be realized as subject as in (1b), termed **intermediary instruments**, and those that cannot be realized as subject as in (2b), termed **facilitating instruments**, this thesis aims to provide an analysis to account for this difference and the two instrument types. The framework I develop has two main parts. One is Croft’s (1991) **causal chains** which I shall establish as being central to instrument categorization. The other is a **two tiered a(argument)-structure system** I develop that uses Dowty’s (1991) **proto-roles**. I consider a-structure as a separate representation in the syntax as in Lexical-Functional Grammar (LFG) (see, e.g., Dalrymple (2001)). I argue that instruments share some properties with arguments and some with adjuncts and are therefore best considered as a kind of **a(argument)-adjunct** (Grimshaw (1990)), featuring in the verb’s a-structure. This is the main purpose of the two tiers of the a-structure: they distinguish arguments and a-adjuncts and are central to the mapping algorithms I present dealing with instrument constructions. These constructions are, in my terms, the **standard instrument construction** (e.g. (1a)), the **passive construction (with instrument)** (e.g. (3)), the

instrument as subject construction (e.g. (4)), and the **instrument unaccusative construction** (e.g. (5)).

(3) The door was opened (by Jack) (with the key).

(4) The key opened the door.

(5) The door was opened with the key.

The last of these has received no attention in the literature, and is the topic of Chapter

5.

2 Instrument Categorization

2.1 Introduction

In this chapter I discuss the categorization of instruments. In English, instruments are realized most often with ‘with’, and in this study these are the instruments with which we are concerned. Other uses of ‘with’ are briefly surveyed in section 2.2. Section 2.3 surveys the relevant literature and gives evidence for the two kinds of instruments, intermediary and facilitating. Section 2.4 investigates whether instruments are arguments, a(argument)-adjuncts, or adjuncts and concludes that they are a-adjuncts.

2.2 English *with*

The English preposition ‘with’ is quite prolific in its number of roles or functions. Schlesinger (1995) gives six functions of ‘with’ based on samples collated by Hill (1968):

Instrument

He cut the rope with his knife.
He covered her with a blanket.

Opposition

What he just said conflicts with what you told us.
France went to war with Germany.

Accompaniment

John came back with the newspapers.
He went to the movies with his wife.

Manner

She left with a laugh.
They stood with their hats off.

Cause

She was charmed with the film.
He was paralyzed with fright.

Material

He cooked the potatoes with pepper.
He built the wall with bricks.

Schlesinger (1995: 15-16)

Here we are concerned with ‘with’ in its instrumental use and the other uses of ‘with’ do not concern the current study.

2.3 Two Types of Instrument

2.3.1 Intermediary and Facilitating Instruments

Several studies observe that some instruments can be expressed in subject position as well as in adjunct-type positions with ‘with’, whereas others cannot. This observation goes back to at least Fillmore (1968), but is also made in Nilsen (1973), Wojcik (1976), Marantz (1984), Ono (1992), Schlesinger (1995), Levin & Rappaport Hovav (2005), *inter alia*. Consider the following contrast.

- (1) a. Jack opened the door with the key.
b. The key opened the door.
- (2) a. Emily devoured the pasta with the fork.
b. *The fork devoured the pasta.

Instruments of the kind in (1) that can appear in subject position have been called **intermediary** instruments, while those of the kind in (2) that cannot appear in subject position have been labelled **facilitating**¹ instruments (Levin & Rappaport Hovav (2005: 39)). Marantz (1984: 247) argues that ‘the key’ in (1) is an intermediary agent in the act of opening the door: Jack does something to the key, the key does something to the door, and the door results in an open state. In (2), in contrast, while ‘the fork’ is a tool in Emily’s devouring of the pasta, it is not an intermediary agent in the devouring event. However, while this observation has been noted in a number of works such as those aforementioned, it has not received much detailed analysis and

¹ Facilitating instruments have also been labelled ‘enabling’ instruments (Levin & Rappaport Hovav (2005: 39); I shall use the term facilitating.

remains largely descriptive (we shall see in Section 2.3.3 one proposed analysis). I shall refer to the construction in (1b) as the **instrument as subject construction**.

2.3.2 Are instruments agents?

Agent and *instrument* are two of a number of **thematic roles** (also called ‘semantic roles’; Fillmore (1968) uses the term ‘case’) which are labels identifying the role that each of a verb’s arguments plays in the event the verb denotes (see, e.g., Levin & Rappaport Hovav (2005: 35ff) for an overview). For example, the verb ‘put’ is typically associated with the roles *agent* (the actor responsible for moving the object), *theme* (the object that is being moved), and *location* (the place where the object is moved to). The idea is that thematic roles generalize across verbs certain roles for arguments, so, for example, ‘give’ also uses the agent and theme roles akin to ‘put’, but uses *recipient* (the receiver of the object) instead of location.

Fillmore (1968) presents an argument that since ‘the key’ in (1a) is an instrument and (1a) and (1b) could refer to the same scenario, ‘the key’ in (1b) must also be an instrument. Fillmore uses the Conjunction Test as a way of showing that agents and instruments are distinct (Fillmore (1968: 22)). In general, only arguments with the same thematic role can be conjoined.

- (3) a. Carol and Henry hit the horse.
b. *Carol and the stick hit the horse.

- (4) a. John and Ian opened the door.
b. *John and the key opened the door.

See Fillmore (1968: 81) and also Schlesinger (1989: 201)

(3a) and (4a) are acceptable because both nouns in the conjoined phrase are agents; the b-examples are ungrammatical because an agent is conjoined with an instrument. Consequently, Fillmore argues against categorizing ‘the key’ as an agent in (1b)

instead of an instrument. Schlesinger (1989) proposes a different analysis to this arguing that such subjects as those in (3)-(4) are all agents but that they vary in their degree of agentivity. The b-examples in (3)-(4) are ungrammatical for Schlesinger because the two nouns have different degrees of agentivity. He provides the following data to support his proposal.

- (5) a. Floods and guerrilla forces ravaged the area.
b. The cheering crowd and the passing train drowned out their voices.
c. Percy and the new Citroen won the race.
d. The battleship and the Admiral who commanded the cruisers bombarded the coast.
e. Peter and the computer played a game of chess.

Schlesinger (1989: 201)

Schlesinger analyzes the conjoined nouns in the subject position in the above examples under Fillmore's terms as containing different thematic roles (agents and instruments) yet judges them to be grammatical and hence they are problematic for Fillmore's analysis. Under Schlesinger's own proposal the conjoined nouns are all agents that, while not necessarily identical in their degree of agentivity, are high in agentivity and consequently are acceptable. It is worth pointing out that the examples (5a, b, d) do not really contain instruments of any kind and so are not comparable examples:

- (6)² a. *Floods ravaged the area with guerrilla forces.
b. *The cheering crowd drowned out their voices with the passing train.
c. *The battleship bombarded the coast with the Admiral who commanded the cruisers.

'The new Citroen' in (5c) is an intermediary instrument, and 'the computer' in (5e) can also be an intermediary instrument on the reading where Peter plays a game of

² These examples are grammatical if 'with' is interpreted as *accompaniment* (see Section 2.2), but ungrammatical if interpreted as instruments, and that is the point being made here.

chess using the computer against another opponent, as for example in Advanced Chess (or cyborg or centaur chess).

In light of (5c, e), Schlesinger's argument shows it is problematic to make a sharp divide between agents and instruments as Fillmore does. On the other hand, he does not label all what-would-otherwise-be-instruments as agents and argues agents and instruments are distinguishable due to their degree of agentivity. What Fillmore's and Schlesinger's accounts have in common therefore is that some distinction should be made between agents and instruments, and I will take this insight seriously. The approach I shall take is to adopt Dowty's (1991) **proto-roles** and show how this allows us to distinguish agents and instruments through degrees while not placing them in different categories (Sections 3.4 and 3.6 below).

2.3.3 Attempting to account for Instruments as Subjects

One recent attempt to account for instruments as subjects is Alexiadou & Schäfer (2006). They suggest that intermediary instruments can be licensed as subjects under two interpretations. In the first, instruments are conceptualised as eventive, or being involved in an event; in the second, instruments contribute in a non-trivial way to the coming about of the event. They equate the first type of instruments with other *causers* such as natural causes like 'the wind' and the second type with *agents*; as such, the first type of instruments can be termed **causer-like instruments** and the second type **agent-like instruments**. Both are sub-varieties of intermediary instruments.

For Alexiadou & Schäfer (2006), causer-like instruments are involved in an event without being (permanently) controlled by an agent; that is, there is a point in the event where they have a kind of causal independence. This way of licensing an

instrument as subject follows Kamp & Rossdeutscher (1993) who term instruments that can be realized as subjects on this ground as **instrument causers** and those that cannot as **pure instruments**. For example:

- (7) a. The doctor cured the patient with the scalpel.
b. *The scalpel cured the patient.
- (8) a. The doctor cured the patient with the camomile.
b. The camomile cured the patient.

Modified from Alexiadou & Schäfer (2006: 42)

The instrument ‘the scalpel’ in (7) is a pure instrument and as such cannot be realized as a subject ((7b)), whereas ‘the camomile’ in (8) is an instrument causer in Kamp & Rossdeutscher’s (1993) terms or a causer-like instrument in Alexiadou & Schäfer’s (2006) and as such can be realized as a subject ((8b)). Conceptually, the scalpel must be under permanent control of the agent; but the camomile, on the other hand, need not be and can be conceived as an independent cause in the bringing about of the event, namely the curing of the patient. This is what permits the instrument ‘camomile’ to be realized as subject.

Alexiadou & Schäfer (2006) rightly point out that not all instruments that can be realized in subject position are licensable in this way. That is, some instruments that can be realized as subjects cannot be conceived as having the kind of independence causer-like instruments possess such as the camomile in (8b). (Clearly this is a limitation of Kamp & Rossdeutscher’s (1993) account who offer just the one way of licensing instruments as subjects.) Alexiadou & Schäfer (2006) cite the following examples to illustrate:

- (9) a. Ashley cut the melon with a knife.
 b. Casey opened the door with the key.
- (10) a. This knife cuts the melon easily.
 b. This key opened that door.
- (11) a. Cathryn ate spaghetti with a fork.
 b. Denis is drinking juice with a straw.
- (12) a. *This fork ate spaghetti.
 b. *This straw drank juice.

Alexiadou & Schäfer (2006: 44)

Alexiadou and Schäfer observe that the instruments as subjects in (10) are acceptable, yet they must be under permanent control of the agent (cf (7b)), and hence they cannot be categorized as causer-like instruments and licensed along the same lines. Instead, they are agent-like instruments, the other sub-variety of intermediary instruments³. For Alexiadou and Schäfer, there are two requirements that permit sentences like those in (10). The first is that there must be an element of focus; the demonstratives in (10) put contrastive focus on the instruments. A case like (13a) for Alexiadou and Schäfer is only grammatical if ‘the key’ is given some contrastive focus.

- (13) a. ?(?)The key opened the door.
 b. THIS key opened the door.
 c. The KEY opened the door.

Alexiadou & Schäfer (2006: 45)

However, the judgement that (13a) must have contrastive focus is not one shared by all native speakers (including myself), and is not a judgement found in a sampling of 4,210 Google hits for “The key opened the door” (22/03/08). So this first requirement is not accurate, but is fortunately not the crucial one as it cannot itself, as Alexiadou

³ Nilsen (1973) terms instruments of this kind that can be realized as subjects as ‘tools’ and those that cannot as ‘secondary tools’.

and Schäfer rightly acknowledge, differentiate grammatical cases from ungrammatical ones. Consider the following:

- (14) a. *The rag cleaned the table.
b. *THIS rag cleaned the dishes.
c. *The RAG cleaned the dishes⁴.

Alexiadou & Schäfer (2006: 45)

The sentences in (14) also have contrastive focus yet none are grammatical. To account for the contrast in grammaticality between the instruments as subjects in (13) and in (14), Alexiadou and Schäfer suggest the second of the two requirements: that there is a non-trivial relation between a property of the instrument as subject and the event expressed by the whole VP. The coming about of the event must be dependent on this property of the instrument, and this derives the difference between agent-like instruments and mere facilitating instruments as shown in the contrast between (13) and (14). (Following Marantz (1984) and Kratzer (1996), Alexiadou & Schäfer (2006) sever the external argument from the VP and reference the insight that the specific interpretation of the agent depends on the whole VP complex: this is their motivation for treating this kind of instrument in subject position as agents, and hence the label I use here, agent-like instruments.) Unfortunately, Alexiadou and Schäfer give no further detail as to what constitutes a satisfactory property of the subject to permit grammaticality and so this requirement is not explicit. It is possible that they have something such as **conceptual features** in mind⁵. In the next subsection then, I will sketch what an account of using conceptual features could look like in an attempt to see whether such an analysis could work. Unfortunately I will conclude it does not.

⁴ Google hits for (14c), the most successful of these three, “The rag cleaned dishes”: 3, all linguistic literature, and all asterisked or question marked, (21/03/08).

⁵ In Section 4.4, I introduce the Animacy Condition which stipulates the subject of certain verbs must be [+ANIMATE]. I also consider whether this could be what Alexiadou and Schäfer have in mind and conclude that it cannot be.

2.3.4 An attempt using Conceptual Features to account for Agent-like Instruments

Featural conceptual representation decomposes lexical items into conceptual features, each lexical item therefore being composed of a number of conceptual features. Featural conceptual representations are assumed by a number of authors (see, e.g., Collins & Quillian (1969), Smith & Medin (1981), Jackendoff, (1990; 2002)). Conceptual features have to themselves be expressed in words, and can be considered as properties of the lexical items. An example is that the lexical item ‘strawberry’ has, among others, the conceptual features <red> and <fruit>. Some psycholinguistic research has endeavoured to find conceptual features for lexical items. For example, Vigliocco et al (2004) asked 20 speakers to generate features sufficient to define and describe different words, with instructions ensuring that participants avoided free associations and the use of “dictionary style” definitions. A sample of their results is given in (15).

(15) Examples of features produced (weights in parentheses represent the number of participants who listed that feature for the specific word)

Sample object noun	Sample action verb	Sample action noun
<i>‘the strawberry’</i>	<i>‘to scream’</i>	<i>‘the trade’</i>
red (20)	loud (16)	exchange (16)
fruit (18)	fear (14)	give (8)
sweet (13)	noise (9)	by humans (7)
has seeds (12)	vocal (8)	receive (6)
grows (10)	high-pitched (6)	2 participants (4)
small (6)	yell (6)	money (3)
taste (6)	emotional (4)	action (3)
food (5)	extreme (4)	barter (3)
from garden (5)	help (4)	fair (3)
juice (5)	sound (4)	goods (3)
dessert (3)	action (3)	swap (3)
eat (3). . .	by human (3). . .	agreement (3). . .

Vigliocco et al (2004: 430)

I conducted an informal interview with 9 native speakers of UK English asking them to give features for 5 lexical items which can function as instruments. I disregarded

free associations (e.g. ‘door’ in response to ‘key’) and grouped some responses together (e.g. ‘lock’, ‘unlock’ and ‘open’ for ‘key’). The results are in (16).

(16) Top 5 features produced (weights in parentheses represent the number of participants who listed that feature for the specific word)

<i>‘key’</i>	<i>‘glue’</i>	<i>‘scissors’</i>	<i>‘washing machine’</i>	<i>‘pen’</i>
lock/unlock/open (9)	stick/sticky (9)	cut (9)	heavy (8)	write (9)
metal (8)	smelly (7)	sharp (9)	clean/wash (7)	contains ink (6)
small (7)	intoxicates (5)	metal (7)	metal (7)	hand-held (5)
hard (4)	liquid (3)	hand-held (5)	big (5)	draw (4)
important (3)...	small (3)...	flat (2)...	box-shaped (4)...	thin (4)...

Despite ‘stick’ being a verb and showing function and ‘sticky’ being an adjective and showing a characteristic, I grouped these responses together for ‘glue’ as no participant gave both ‘stick’ and ‘sticky’, probably because the stem is the same and the difference otherwise is a morphological one.

The conceptual features shown in (16) at first glance are promising for a featural account. In the following examples for the first four instruments listed in the top row of (16), we indeed see that a salient property of the instrument is one that is characterized by the event denoted by the VP, and indeed all these instruments can be realized as subject.

- (17) a. The key locked the door.
- b. The glue stuck the paper.
- c. The scissors cut the card.
- d. The washing-machine cleaned the clothes.

However, when we consider the last sample instrument ‘pen’, the result is not good.

(18) *The pen wrote a letter.

In this case, the sentence is clearly ungrammatical, and yet the instrument shares a salient feature with the event denoted by the VP just as the cases in (17). Hence this way of accounting for which instruments can and cannot be realized as subjects using

conceptual features does not work. Note that it is not the instrument ‘pen’ that is problematic: any possible instrument that could be used to write a letter cannot realize as subject:

- (19) a. Ed wrote the letter with the pencil / quill / typewriter / keyboard / computer / MS Word.
 b. *The pencil / quill / typewriter / keyboard / computer / MS Word wrote the letter.

2.3.5 Interim Summary

We have seen good evidence for the categorization of instruments into two types, intermediary and facilitating. We have also seen that Alexiadou & Schäfer (2006) argue for a subcategorization of intermediary instruments. A summary of the proposals we have seen so far is given in table (20).

(20)

	Instrument Type	
	<i>Intermediary</i>	<i>Facilitating</i>
Kamp & Rossdeutscher (1993)	1) Causal Independence	
Alexiadou & Schäfer (2006)	<i>Causer-like</i> 1) Causal Independence	<i>Agent-like</i> 1) Property/feature Relation

Table (20) shows that Kamp & Rossdeutscher (1993) adopt the distinction between intermediary and facilitating instruments and rely on one condition to license intermediary instruments in subject position. Alexiadou & Schäfer (2006) also adopt the distinction between intermediary and facilitating instruments but further subcategorize intermediary instruments into two types, causer-like and agent-like instruments. Each subcategory has an independent condition that licenses intermediary instruments in subject position. I have argued that the first condition is valid and captures in part how instruments are licensed as subjects, but that the second

condition is incorrect and should be rejected. I propose alternative conditions in Chapters 3 and 4.

2.4 Instruments: arguments, adjuncts or a(rgument)-adjuncts?

Arguments are the necessary phrases demanded by the verb that must be realized in the linguistic expression (e.g. Dowty's (1982) Subcategorization Test aims to distinguish arguments and adjuncts on the grounds that only arguments are obligatory). Both 'the door' and 'the pasta' in (21a) and (22a) respectively are arguments in this sense as, if they are omitted ((21b) and (22b)), the constructions become ungrammatical.

- (21) a. Jack opened the door with the key.
b. *Jack opened with the key.
- (22) a. Emily devoured the pasta with a fork.
b. *Emily devoured with a fork.

Under this test, instruments are not arguments because their omission does not result in ungrammatical sentences:

- (23) Jack opened the door.
(24) Emily devoured the pasta.

Adjuncts are different in that they are not required by the verb, although they do add extra information to the linguistic expression. There can be zero or potentially an infinite number of adjuncts, although in reality this number is restricted by human cognition and pragmatics. (25) and (26) each contain 3 adjuncts, all individually optional, and in any combination (some, but not all, of the permutations are shown here).

- (25) a. Today₁, Jack opened the door quickly₂ at four o'clock₃.
 b. At four o'clock₃ today₁, Jack opened the door quickly₂.
 c. Quickly₂, Jack opened the door at four o'clock₃ today₁.
- (26) a. Yesterday₁, Emily devoured the pasta outside on the lawn₂ in a hurry₃.
 b. Outside on the lawn₂ yesterday₁, Emily devoured the pasta in a hurry₃.
 c. Emily devoured the pasta in a hurry₃ yesterday₁ outside on the lawn₂.

Under this test, instruments are not adjuncts either as their number cannot be multiplied.

- (27) *Jack opened the door with the key₁ with the swipe card₂.
 (28) *Emily devoured the pasta with a fork₁ with a spoon₂.

Although adjuncts are not restricted in number, nevertheless they cannot be added in such a way as to result in a contradiction or conceptual conflict, unless through coordination. Consider the following.

- (29) a. *Jack opened the door at 3 o'clock at 4 o'clock.
 b. *Lena went to Las Vegas by plane by ship.
 c. *Ken quickly went to the store slowly.

These examples are all ungrammatical. However, if the two adjuncts are conjoined with 'and', the sentences are grammatical, although (29c) does not permit this.

- (30) a. Jack opened the door at 3 o'clock and at 4 o'clock.
 b. Lena went to Las Vegas by plane and by ship.

This situation is the same for instruments: when conjoined, more than one is acceptable.

- (31) a. (cf (27)) Jack opened the door with the key and with the swipe card.
 b. (cf (28)) Emily devoured the pasta with a fork and with a spoon.

Hence instruments are restricted in number (when not conjoined) for conceptual reasons like many other adjuncts. This holds for both types of instrument and so does not distinguish intermediary from facilitating instruments and the reason for their distinction remains unexplained.

This means instruments share one property each with arguments and adjuncts, and, in turn, do not share one property with arguments and adjuncts. To acknowledge this result, I adopt an additional category which is something similar to Grimshaw’s (1990) **a(argument)-adjuncts** (see Grimshaw (1990: 108ff)). For Grimshaw, a-adjuncts are licensed by a-structure but do not receive a thematic role. I will not employ thematic roles but proto-roles which will be used for both arguments and a-adjuncts (Section 3.4). A-adjuncts in the system I propose do receive a proto-role and feature in a-structure. The similarities and differences between arguments, adjuncts and a-adjuncts are shown in the table below.

(32)

	Argument	Adjunct	Argument-adjunct
Optional	NO	YES	YES
Number restricted	YES	NO	YES
In verb’s a-structure	YES	NO	YES

The last characteristic, whether the category is represented at a-structure or not, is a theoretical one and used to capture formally (part of) the distinction between arguments and adjuncts. The theoretical claim made for a-adjuncts is that they are represented at a-structure like arguments (Grimshaw (1990: 109)). This accounts for their number restriction. From these characteristics, instruments appear to be a-adjuncts: they are optional and their number is restricted. However, we want a way to distinguish intermediary and facilitating instruments and so there is still work to be done. I think this can best be done through a consideration of their **causal force** on

bringing about the event. This proposal will be one of the central thrusts of the subsequent chapters.

2.5 Summary

We saw that Alexiadou & Schäfer's (2006) categorization of instruments is quite subtle in making an internal distinction in the category of intermediary instruments, between causer-like instruments and agent-like instruments. Moreover, they provide an explanation for why these instruments can realize as subjects whereas facilitating ones cannot. While I have accepted that their account of causer-like instruments has merit, I have argued that their account of agent-like instruments is insufficient. In the next chapter, I shall not adopt the subcategorization of intermediary instruments adopted by Alexiadou & Schäfer as we shall see that it is not necessary, and, in any case, there is not an explicit or a successful analysis available for one of the subcategories (agent-like instruments). Instead, I introduce Croft's (1991) causal chains and, following the idea of Alexiadou & Schäfer (2006) and in turn of Kamp & Rossdeutscher (1993) in relation to causer-like instruments that there must be some causal independence, cast the distinction in this apparatus. Even so, there are examples that still cannot be accounted for, and to deal with them I shall propose in Chapter 4 that some verbs require a subject that must be [+ANIMATE].

I also showed that there are good reasons to posit intermediary and facilitating instruments as a-adjuncts. How to capture their differences will be shown in the next chapter through consideration of their **causal force** in bringing about the event denoted by the VP.

3 A-structure of Intermediary Instruments

3.1 Introduction

In this chapter, I shall introduce the apparatus that I will use to analyze and account for the two types of instrument. This shall include **causal chains** and **proto-roles** and how these two are fused together. In Section 3.5 on causal chains, key concepts will be **onset causation** and **extended causation**. At the end of Section 3.5, I also describe what I mean by **semantically implied** and **syntactically implied** arguments and a-adjuncts, and the mechanisms of **deletion**, **demotion** and **promotion** in a-structure. Section 3.8 provides a brief comparison with instruments in Japanese to draw out some of the conceptual versus grammatical elements of instruments. In Section 3.2, I outline the LFG standard a-structure and mapping theory system and identify three shortcomings in its capacity to deal with instruments.

3.2 The LFG Standard A-structure and Mapping Theory System

The a-structure system presented in this proposal considers a-structure to be an autonomous component of the syntax and is hence compatible with any non-derivational syntactic system such as HPSG. I will also use, however, a few other elements of LFG: the grammatical functions SUBJ, OBJ, OBJ_θ and OBL_θ with the assumption that positions in a-structure are mapped to these grammatical functions in f(unctional)-structure through mapping algorithms. Hence the current work is embedded, albeit not heavily, in some assumptions (e.g. non-derivational syntax) and elements (e.g. grammatical functions) of LFG. As such, a brief comparison with LFG's standard a-structure system and mapping theory is in order. I will show why the current system is preferable concerning instruments.

The standard a-structure and mapping system presented here follows Butt's (1999: 4) account of what is the 'standard' LFG system. It is based on Bresnan & Kanerva (1989), Bresnan & Moshi (1990), Bresnan & Zaenen (1990), and Alsina & Mchombo (1993). This system groups grammatical functions into classes by means of two features: [+/- r(estricted)] and [+/- o(bjective)]. (1) and (2) show how the grammatical functions and the features are associated.

(1) Grammatical Functions	Features
SUBJ	[-r, -o]
OBJ	[-r, +o]
OBJ _θ	[+r, +o]
OBL _θ	[+r, -o]
(2) Features	Grammatical Functions
[-o]	SUBJ, OBL _θ
[+o]	OBJ, OBJ _θ
[-r]	SUBJ, OBJ
[+r]	OBJ _θ , OBL _θ

Butt (1999: 5)

This system also assumes thematic roles and a thematic hierarchy, shown in (3) (the concept of thematic roles was outlined in Subsection 2.3.2). This is the thematic hierarchy endorsed by the LFG standard a-structure system.

(3) Thematic Hierarchy

agent < beneficiary < experiencer / goal / recipient < instrument < patient / theme < locative
 Bresnan & Kanerva (1989)

The thematic hierarchy is intended to assist mapping: the higher thematic roles get mapped to grammatical functions before those lower on the hierarchy; the higher thematic roles take precedence. This means that, for example, in unmarked situations, an agent, when present, will take priority in mapping as it is hierarchically the highest thematic role. The LFG standard a-structure and mapping theory system follows this principle through the use of the features. Thematic roles are assigned the same

features we saw above and it is these features that are used to map thematic roles onto grammatical functions in f(unctional)-structure. So it is the features along with the hierarchy that determine the mapping between thematic roles and grammatical functions.

(4) Association of features with thematic roles

Patient-like roles: [-r]

Secondary patient-like roles: [+o]

All others: [-o]

(Bresnan & Zaenen (1990))

The mapping principles are that the first [-o] argument is mapped to SUBJ. If there is no [-o] argument, then the first [-r] argument is mapped to SUBJ. If neither of these apply, then the plus value ([+r] or [+o]) is added to the feature structure and the following mappings applied: [-o,-r]: SUBJ; [+o, -r]: Object (OBJ), [-o,+r]: prepositional-marked oblique (OBL_θ), [+o, +r]: prepositional-marked object (OBJ_θ).

In the LFG standard system, the mapping of instruments proceeds in the following way. The sentence ‘Jack opened the door with the key’ would be mapped as in (5):

(5)	<u>Jack</u> opened <u>the door</u> with <u>the key</u> .		
<u>Thematic role:</u>	<i>agent</i>	<i>theme</i>	<i>instrument</i>
<u>Features:</u>	[-o]	[-r]	[-o]
<u>Thematic Hierarchy Rank:</u>	1	5	4
<u>Mapped to:</u>	SUBJ	OBJ	OBL _θ

‘Jack’, being an agent, has the feature [-o] and, being highest on the thematic hierarchy of the arguments present, is mapped to SUBJ. ‘The door’ as a theme has the feature [-r] and so is mapped to OBJ. Finally, ‘the key’ is an instrument with the feature [-o] and ranked 4 on the thematic hierarchy: as SUBJ is already filled, this argument is mapped to OBL_θ, namely OBL_{INS}.

The above mapping algorithm is fine; but there are problems arising from further considerations of instrument constructions. Firstly, there is nothing in this system to indicate that ‘with the key’ in (5) is an optional argument. As argued for in Section 2.4, ‘Jack’ and ‘the door’ are arguments in (5), but ‘the key’ is an a-adjunct, differing because it is optional. In the LFG standard a-structure system there is no way to capture this difference; this is indeed a principal advantage of the two tier system I introduce below.

A second problem is that the LFG standard a-structure system does not itself show why intermediary instruments and facilitating instruments are different. As seen in Section 2.3, there is strong evidence to support these two types of instrument. We do not want to put both types of instrument in a-structure in the same way – we do not want to map, e.g., ‘Emily devoured the fork with the pasta’ the same way as ‘Jack opened the door with the key’ in (5) as we would then predict ungrammatical sentences such as *‘The fork devoured the pasta’ to be grammatical. There is no mechanism within the LFG standard a-structure system to differentiate the two types of instrument⁶.

Thirdly, the relationship between agent and instrument is not captured by thematic roles and the feature system. The thematic roles agent and instrument are both [-o], but so is experiencer. Agent and instrument differ significantly to experiencer in that the first two but not the latter have causal force. This difference cannot be captured by

⁶ Admittedly the differentiation of the two instrument types does not have to be done in a-structure in the LFG system; it could, for example, be handled in semantic-structure. Of course, this would want to be motivated. The motivation for dealing with instrument types in the kind of a-structure I use here is that, as I argue below, conceptual structure informs a-structure of linguistically relevant information concerning instruments and that this affects the mapping to grammatical functions in f-structure. In any case, there is not a mechanism in any structure of LFG of which I am aware that deals with instrument types, and so the current proposal is progressive.

a system such as the LFG standard system that uses only thematic roles and features. We will see that **proto-roles** can capture this difference.

3.3 The Two Tier A-structure System

We have seen that there is good reason to cast instruments not as arguments or adjuncts but as a kind of a-adjunct. This needs to be represented in the a-structure in some way; as we saw above, failure to do this is a weakness of the LFG standard a-structure system. I propose to do this by adding a **second tier** to the a-structure. This second tier will contain a-adjuncts, leaving the first tier for arguments. I shall use the following representation:

(6) VERB 1st tier < α β >
2nd tier < γ >

The verb whose a-structure is represented will slot into ‘VERB’. α and β represent 1st tier arguments. γ represents an a-adjunct – I shall refer to these items as **second tier arguments** (i.e., 2nd tier arguments correspond to a-adjuncts). The properties of 2nd tier arguments are that they are optional in that they need not be realized, but they are listed in the a-structure and so their number cannot be increased like they can for adjuncts (see (32) in Section 2.4).

3.4 Proto-roles

The a-structure I shall adopt does not utilize fixed thematic roles. The differences between arguments will be captured in relative terms using Dowty’s (1991) proto-roles. Dowty ((1989), (1991)) argues that arguments are associated with lexical entailments (or presuppositions) imposed on them by their verbs. Thematic roles are then best understood as labels for clusters of lexical entailments imposed on arguments by predicates. Dowty further argues that a label for a cluster of lexical

entailments is only warranted in cases where they exhibit significant linguistic generalizations; he calls these “L-thematic roles” (Dowty (1989: 77)). For argument selection, Dowty proposes only two such L-thematic roles need be recognized, the proto-roles **proto-agent** and **proto-patient**. These are the properties he associates with each of these proto-roles.

(7) Contributing properties for proto-agents:

- (a) volitional involvement in the event or state
- (b) sentience (and/or perception)
- (c) causing an event or change of state in another participant
- (d) movement (relative to the position of another participant)
- (e) exists independently of the event named by the verb)

(8) Contributing properties for proto-patients:

- (a) undergoes change of state
- (b) incremental theme
- (c) causally affected by another recipient
- (d) stationary relative to movement of another participant
- (e) does not exist independently of the event named by the verb)

Dowty (1991: 572)

The last property of each list is parenthesized as Dowty is unsure whether they belong to the discourse dimension of subjecthood rather than the semantic dimension. Any particular argument does not have to possess all the properties to be labelled a proto-agent or a proto-patient. In addition, arguments can exhibit stronger and weaker degrees of agent- or patient-hood. Although the proto-role system and the other apparatus I shall use do not make use of thematic roles such as agent and instrument, I shall use the terms agent and instrument liberally to refer descriptively to the corresponding NPs in the surface sentences. This is also for ease of reference: it is simpler to say e.g. ‘agent’ rather than having to refer to ‘the 1st tier proto-agent with proto-properties x and y’ each time. This descriptive use of these terms should be straightforward.

The similarities between agents and instruments can be captured via proto-roles in this way: they both tend to possess proto-agent properties (7c) and (7d). The difference between agents and instruments on the one hand and experiencers on the other is that experiencers do not possess (7c) and (7d). The relationship between agents and experiencers is that they both possess proto-agent property (7b). Thus the proto-role system can capture the similarities and differences between the surface labels of agent, experiencer and instrument (and indeed others), something that the LFG standard a-structure system cannot do, as I noted in Section 3.2, and so shows how the current proposal is preferable to it. This also satisfies the conclusion reached in Subsection 2.3.2 that agents and instruments should be of the same category but still distinguishable.

There are some acknowledged problems with proto-roles (see Levin & Rappaport Hovav (2005: 53ff)). One obvious problem is that in having only two proto-roles it is difficult to deal with ditransitive verbs. If an argument has the same number of proto-agent and proto-patient entailments, it is neither proto-agent nor proto-patient, so there are three possibilities for an argument: proto-agent, proto-patient, and a neutral label with respect to these. But in practice, it is unlikely for an argument to be neutral, which leads to two of the three arguments of a ditransitive verb receiving the same proto-role, and so, without some refinement, they will be indistinguishable. Although we are not here dealing with ditransitive verbs, this problem is nonetheless relevant because I have claimed instruments are a-adjuncts and feature in the verb's a-structure. This means we will have three proto-roles in the a-structure: the proto-agent associated with the agent, the proto-patient associated with the L-OBJ, and the proto-

role⁷ associated with the instrument. This reveals an important advantage of introducing a 2nd tier: it can be used to distinguish the two arguments (or argument and a-adjunct in Grimshaw's terms) that receive the same proto-role: one is on the 1st tier and the other is on the 2nd tier. Thus I propose a verb such as 'open' to have the following a-structure.

(9) open 1st tier < p-a p-p >
2nd tier < p-a >

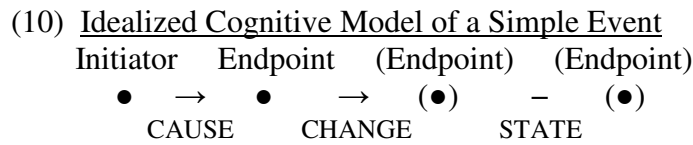
The instrument, appearing on the 2nd tier, is a proto-agent as it will have some if not all proto-agent properties (7c-e). This is intuitive as we have already witnessed the alternation where such instruments are realized as subjects (Subsection 2.3.1), the syntactic position typically linked with proto-agents. This also captures Schlesinger's (1989) and Alexiadou & Schäfer's (2006) suggestions and arguments that agents and instruments have properties in common. Both Alexiadou and Schäfer's cause-like instruments and agent-like instruments are captured in this way – in possessing (7c) instrument proto-agents are cause-like and in possessing some other proto-agent properties are agent-like – and so this provides motivation for conflating rather than adopting this intermediary instrument-internal distinction.

3.5 Causal Chains

Croft's (1991) Causal Order Hypothesis takes a causal approach to event structure. He builds on Talmy's (1988) work on the dynamics of force and takes as his approach's philosophical underpinning Davidson's (1969) *The Individuation of Events*, where it is argued that causal structure defines events. Croft proposes to apply Davidson's ideas to lexical items. His hypothesis represents events by their parts and the causal

⁷ We shall see below that instruments will be proto-agents.

relations between them. The mechanism he develops is that of **causal chains**, which do away with thematic roles. What were specific thematic roles become specific points in the causal chain. Croft’s causal chains are grounded in a cognitive model represented in (10) below.



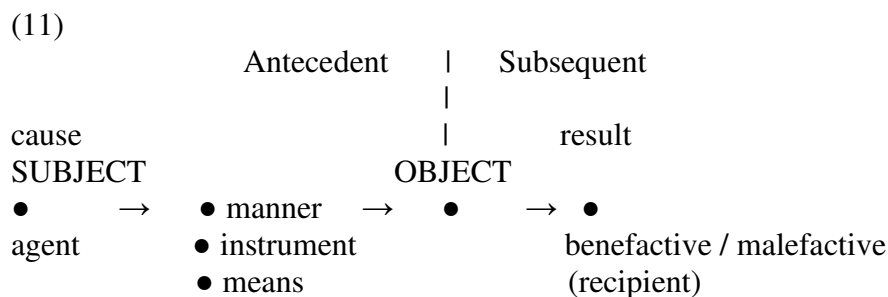
(Croft 1991: 37)

Croft’s remarks on the notation are:

“a dot indicates a participant; an arrow indicates a relationship of transmission of force, which can be described by the capitalized label just below it; a line without an arrowhead indicates a noncausal (stative) relation; a parenthesized dot indicates that it is the same participant as in the preceding causal (or noncausal) segment.”

(Croft (1991: 37, n.5)

Causal chains are embedded in this cognitive model; we can regard the causal chain as some of the linguistically relevant parts of the cognitive model. (11) is a schematic of a causal chain.



VERB SEGMENT

modified from Croft (1991: 185)

Again, dots represent participants and arrows indicate a relationship of transmission of force. The causal chain centres around the OBJECT which undergoes the change; hence the components are divided into what is Antecedent to the OBJECT and what is

Subsequent to it. What is Subsequent can be, for example, a benefactive, such as ‘for Bill’ in ‘Luke bought a book for Bill.’ This aspect of the causal chain will not concern us at all and I will refer to it no further. Antecedent aspects are relevant: there is the cause of the event, coinciding here with the SUBJECT and the agent, and then, between the SUBJECT and OBJECT, three possible dots that represent manner, instrument and means, of which instrument is the only one we will be concerned with.

It is clear that what Croft means by SUBJECT and OBJECT in the causal chain is ‘logical subject’ and ‘logical object’. Verb alternations can be analysed as alternative profilings of parts of the whole event; this is how Croft derives *grammatical* subject and object. For example, in an English passive, Croft’s SUBJECT, if realized, will be realized in a ‘by-phrase’ and Croft’s OBJECT will be realized as grammatical subject in the sentence. Linking points in the causal chain to grammatical roles in the syntax is not central in Croft’s agenda and he does not explain how certain alternations are permitted and how others are prohibited. One major problem is that the concepts of subject, object and oblique are defined in terms of the points they occupy in Croft’s causal chain; subjects are initiators and objects are the final affected entity, for example (Croft (1991: 178)). The surface orderings of these concepts (i.e. spoken sentences) are derived through different mappings, but the concepts remain the same; this means there is no theoretical distinction between logical and grammatical subject, object or oblique. This is problematic because for non-causal verbs not conceptualized in terms of causal chains, the concepts subject, object and oblique cannot be defined. As such, they must be defined in a completely different way. This means subject, object and oblique in surface constituent-structures will be defined differently depending on the verb in the sentence, an undesirable outcome. Positing grammatical concepts outside the causal chain distinct to the logical concepts inside them, and putting these

grammatical concepts in f-structure enables an autonomous definition. For different kinds of verbs, the conceptual principles affecting a-structure can then be different leaving the core grammatical concepts of subject, object and oblique uniformly defined. This is essentially the position taken in the current proposal.

A potential reply to this criticism is that we could use a system employing a distinction between L-SUBJ and SUBJ, L-OBJ and OBJ, and so on, to differentiate points in the causal chain from grammatical entities, and this would avoid the problem outlined above in conflating the two. Moreover, it would be more faithful to Croft's proposal in using points in the causal chain to replace thematic roles. However, the same problem would remain in that the L-SUBJ and L-OBJ are defined in terms of the causal chain and so, L-SUBJs and L-OBJs of non-causal verbs would have to be defined in a different way. Using alternative constructs in a-structure again avoids this problem (in the current proposal these constructs are proto-roles).

A further problem for Croft relevant to our concerns is that instrument is simply "an entity that is intermediate in a causal chain between the subject (initiator) and the direct object (final affected entity)" (Croft (1991:178)). This fails to distinguish intermediary from facilitating instruments. The proposal here shall address this problem in Subsection 4.2.1.

Concerning the grammatical concepts subject, object and oblique, in the light of the criticisms of Croft, I shall adopt the following system. From here what I shall refer to as SUBJ(ECT) and OBJ(ECT) shall be *grammatical* subject and object as in LFG's terms (see e.g. Dalrymple (2001: 17-24)). Consequently, I shall re-label Croft's SUBJECT and OBJECT as L(OGICAL)-SUBJ(ECT) and L(OGICAL)-OBJ(ECT),

respectively. The VERB SEGMENT is, for us, simply a slot in which to show the verb.

It has been pointed out by a number of researchers that there is a difference between agent cause and instrument cause, in that agent cause is the principal, or initiating, cause, while instrument cause is manipulated in some sense by the principal/initiating cause (e.g. Chapin (1967: 62), Chomsky (1970: 8), Fillmore (1971: 16)). This observation is reflected in the causal chain model (see (11)). Nilsen (1973) argues natural forces (e.g. ‘the wind’, ‘the storm’) are like agents rather than instruments in that they represent a primary rather than a secondary cause. In the following sentences, the subjects of (12a), (12b) and (12c) are an agent, an instrument and a force, respectively.

- (12) a. John broke the window.
b. A hammer broke the window.
c. The storm broke the window.

Nilsen (1973: 100)

The test that shows ‘John’ and ‘the storm’ are primary causes is that the following paraphrase is not available for them, whereas it is for (12b) where the subject is an instrument (Nilsen (1973: 100-101)).

- (13) a. *X broke the window with John.
b. *X broke the window with the storm.
c. X broke the window with the hammer.

Nilsen (1973: 101)

This shows that only an instrument (of the three causal categories given) can be sequentially second in the causal chain. However, because the instrument is sequentially second, this entails that there will be – at the least, implied, if not present – a sequentially prior element in the causal chain, namely an agent. When an item is

implied in this way, I shall refer to it as **semantically implied**. Semantically implied items are present in the causal chain but **deleted** in the a-structure and so not present there. Deletion contrasts with **demotion** and **promotion**: demotion⁸ is when a proto-role is moved from the 1st tier to the 2nd, and promotion is when a proto-role is moved from the 2nd tier to the 1st tier. Deletion of a proto-role means it is removed from the a-structure entirely. Whether a proto-role can be deleted, demoted or promoted is governed by the construction being generated and specifically its mapping algorithm required to achieve that the correct proto-roles are mapped to the correct grammatical functions. These distinctions are important and these terms will be used frequently below. **Syntactically implied** items refer to items that are present in the a-structure but absent in the surface sentence – this means they will be 2nd tier arguments that are not realized. This describes non-realized by-phrases of English passives as we shall see in Sections 3.7 and 5.4. It follows from these descriptions that syntactically implied items are also always semantically implied.

3.5.1.1 Causal Force

I use the concept **causal force** to refer to whether an instrument is conceptualized as being (at least in part) causally responsible for bringing about the event denoted by the VP. For the result state of the event to be brought about by a cause, the process of causation must be ascribed: that is the cause must be linked to the effect. If Peter blinks and the window cracks, a causal link is not conceptualised; but if Peter throws a rock and the window cracks, a causal link may be conceptualised (although not necessarily in this case). For certain effects to be brought about, there may be more than one cause. In the case just hypothesized, both Peter and the rock are causes. This

⁸ Many authors use the term ‘suppression’ for the kind of operation that in a sense removes full argument status; I have chosen the term ‘demotion’ in order to show the term ‘promotion’ is its opposite. There is no significant difference between the terms ‘suppression’ and ‘demotion’.

is a naïve view of causation and not one endorsed by modern physics; but it is the kind of causation conceptualised by humans which linguistic constructions are sensitive to. This is a point well made by Talmy (1988: 50), and there is no need to be concerned with the fact that this crude conceptualisation of causation is very likely not how the physics of causation works in reality: again, it is how humans conceptualise causation and consequently what feeds a-structure and linguistic constructions.

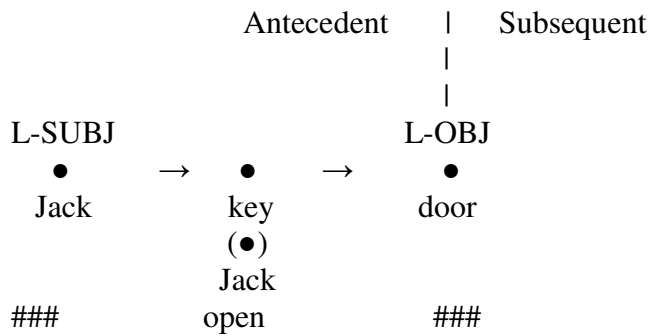
3.5.1.2 Onset and Extended Causation

The concepts **onset causation** and **extended causation** will be essential to our analysis of instruments in the next chapter. Both are taken from Talmy (1988). Talmy uses extended causation to refer the situation in which the L-OBJECT undergoes a change of state through continuous causal interaction with the agent (see also Croft (under contract: 61)). In extended causation, the initiator continues to transmit force to the endpoint, which undergoes a continuous change as a result of the initiator's action. Onset causation differs in that it responds to force dynamic patterns that involve the agent being the initial cause in beginning the change of state but then not continuously interacting with the L-OBJECT. My proposal here is to extend the concepts of onset and extended causation to incorporate agents and instruments. Extended causation for us will refer to the agent and instrument continuously interacting to bring about the change of state of the L-OBJECT. Onset causation will refer to the agent being the initial cause and the instrument the sequentially second cause with the agent and instrument not interacting with each other; they will have causal independence⁹. My

⁹ This follows Kamp & Rossdeutscher's (1993) and Alexiadou & Schäfer's (2006) proposal for causal independence as a condition that licenses instruments as subjects as we saw in Subsection 2.3.3.

proposal is to represent onset causation and extended causation as just outlined in Croft's system as follows. (14) represents a causal chain with extended causation.

(14) Jack opened the door with the key.

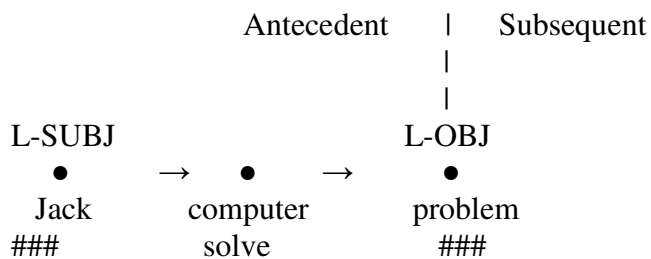


The causal chain in (14) is abridged where the diagrammatic elements and terms deemed irrelevant to the point being illustrated for the given example have been omitted. I shall adopt this practice henceforth.

In (14), 'Jack' is the initial causer. The top middle dot represents 'the key', a new participant, while the dot below it still represents the agent 'Jack' (recall that an old participant is represented in parentheses) showing that the two participants are causally working together to bring about the change. 'The (closed) door' undergoes a change of state to become 'the (open) door'.

(15) represents a causal chain with onset causation.

(15) Jack solved the problem with the computer.



The crucial (and only) difference in (15) compared with (14) is that the agent ‘Jack’ and the instrument ‘the computer’ do not causally work together to bring about the change. ‘Jack’ causes ‘the computer’ (represented by the first arrow) to initiate its own causal force to cause (represented by the second arrow) the problem to undergo the change. ‘Jack’ initiates the causal chain after which his causal force stops and the instrument’s continues. There is no or little overlap in causal force between the agent and the instrument in the causal chain.

3.5.2 Problems with Croft’s Causal Chains

There are a number of problems with Croft’s causal chains acknowledged, indeed, by Croft himself (Croft (under review)); but see also Levin & Rappaport Hovav (2005: Section 4.3)). The central problem is that causal and aspectual structures are conflated and there are some argument realization patterns that cannot be captured through causal chains. For example, verbs like *lean*, *sit* and *stand* describe events where there is no transfer of force or causation and whose argument realization is consequently difficult, if indeed possible at all, to capture in a causal approach (Levin & Rappaport Hovav (2005: 121)). This is a legitimate criticism and Croft (under review) is right to address it: in this new work he adds an aspectual dimension to the causal one in an attempt to deal with this criticism. However, this criticism is only an issue when considering certain kinds of verbs and constructions (hence it is also an issue when considering a language as a whole). An approach such as the one found in Croft (under review) is an attempt to bring together the insights on argument realization from causal approaches such as DeLancey (1984), Jackendoff (1990) and Croft (1991) and from aspectual approaches such as Tenny (1994) and Ramchand (1997). For instruments and instrument constructions, causal structure is the relevant structure and not aspectual structure, and therefore causal chains are adequate for the analysis I

apply. I have chosen to use causal chains as it is unnecessary to introduce a more complex system that includes mechanisms such as aspectual structure wholly redundant to the concerns of the current study. The analysis and mechanisms presented here are compatible with other approaches including aspectual structure as they do not interfere with aspectual structure. Hence the current proposal is free from this criticism of causal chains.

3.6 Proto-roles, Causal Chains and Mapping to F-structure

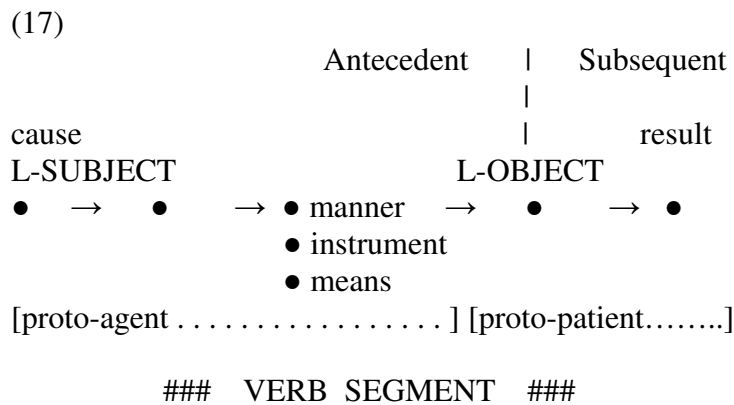
Without going into details, I envision the causal chain to be a part of the conceptual structure of the event that is being expressed by the linguistic expression. The a-structure receives information from the conceptual structure, and hence from the causal chain.

Causal force is an element of the causal chain that informs a-structure as to when arguments and a-adjuncts can and cannot be mapped to certain grammatical functions in f-structure. My proposal here is that *causal force* is translated into the proto-agent property *causing an event or change of state in another participant* (see (7c) above) – let us label this proto-agent property ‘*causal force*’ for brevity. This shows a very smooth transition from causal chains to proto-roles and the connection between them in the proposed system. If a proto-agent has the property *causal force* I shall indicate it when relevant in the causal chain like this:

(16) Jack opened the door.

L-SUBJ		L-OBJ
●	→	●
Jack (CF)		the door
###	open	###

If, for example, a participant has *causal force* in the causal chain, then the proto-role associated with that position possesses *causal force*, and this information will be carried to the a-structure and will be relevant to the grammaticality of constructions. Whether or not a proto-agent possesses *causal force* will be crucial in determining the grammaticality of some instrument constructions as we shall see in the next chapters. Participants that are arguments or a-adjuncts in the causal chain (represented by dots – but note, not dots that are not arguments or a-adjuncts) will correspond to a proto-role. L-SUBJECTs and other participants in the Antecedent area, including instruments, will be proto-agents¹⁰, while L-OBJECTs and other participants in the Subsequent area will be proto-patients. I will leave aside the issue of where arguments that are ‘neither’ proto-agents or proto-patients appear. It is important to note that it is not that points in the Antecedent area *must* be proto-agents but that the proto-role properties these points possess will naturally lead them to be proto-agents, and this goes too for points in the Subsequent area being proto-patients. (17) illustrates this point.



modified from Croft (1991: 185)

Proto-roles and their properties are obtained from the conceptual structure; for our purposes here, this means the causal chain, as we are concerned with instruments and their construction alternations. This means that, e.g., if no instrument is in the causal

¹⁰ Again, this shows the natural relationship between agents and instruments.

chain, then a-structure simply receives no information about instruments. So (18) has the a-structure in (19) while (20) has the a-structure in (21)¹¹:

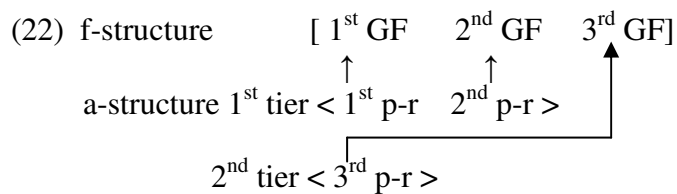
(18) Jack opened the door with the key.

(19) open 1st tier < p-a p-p >
 2nd tier < p-a >

(20) Jack opened the door.

(21) open 1st tier < p-a p-p >

The a-structure system used here is not a subset of the semantics but an interface between conceptual structure and syntax. The proto-roles in the a-structure are ranked in the sense that the first will be mapped to the first grammatical function in f-structure, the second to the second, and so on. The proto-roles in the 1st tier take precedence over those in the 2nd tier. This is shown in (22):



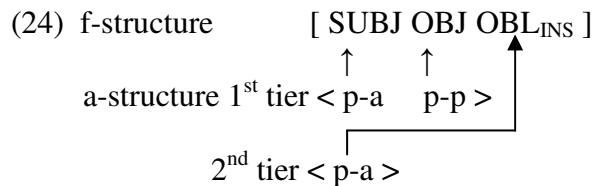
For the standard instrument construction (e.g. (18)), the correct mapping from a-structure to f-structure that we want to ensure is for the proto-agent present on the first tier to be mapped to SUBJECT, leaving the proto-agent on the second tier to be mapped to another position in the chain, and in the context of the current study, that would be to the oblique instrument, OBL_{INS}. I adopt this ranking of grammatical functions: SUBJ, OBJ, OBL_θ. Thus, for our purposes here, the following mapping rules are employed; these follow from the simple ranking procedure outlined above.

¹¹ Of course, as the instrument ‘with the key’ is optional, (20) could have the a-structure given in (19) in the situation where the speaker chooses not to add ‘with the key’. (18) cannot, however, have the a-structure given in (21).

(23) Mapping Rules for the standard instrument construction

- 1st tier proto-agent > SUBJECT
- 1st tier proto-patient > OBJECT
- 2nd tier proto-agent > OBLIQUE_{INS}

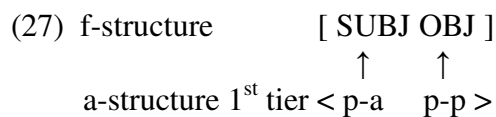
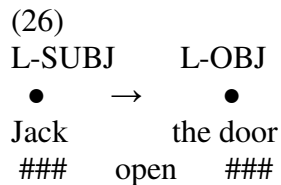
This a-structure representation and mapping rules allow sentences like ‘Jack opened the door’ to be grammatical because the instrument, e.g. ‘with the key’, would appear on the 2nd tier and is hence optional. Diagrammatically, the mapping from a-structure to f-structure for (18) looks like this:



3.7 Linguistic Constructions with the Two Tier A-structure System I

In this section we will see how the two tier a-structure system I have introduced works for simple active and simple passive sentences. (25) has the causal chain representation of (26) and the mapping shown in (27).

(25) Jack opened the door.

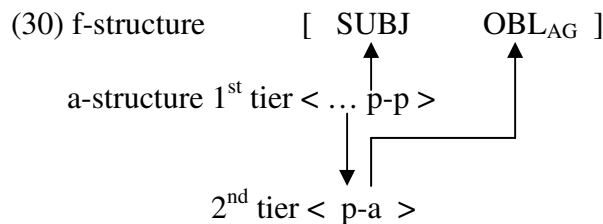
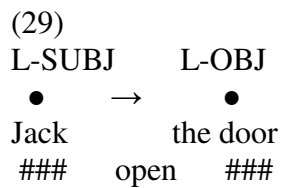


Note that because there is no instrument in the causal chain, the a-structure is not informed of such and hence there is no proto-agent on the 2nd tier. The active sentence in (25) has no instrument and two obligatory arguments, the L-SUBJ of the causal

chain being a proto-agent ('Jack') and the L-OBJ being a proto-patient ('the door'). Obligatory arguments are represented on the 1st tier, and in (27) we see that this is the case.

(28a) is the passive sentence corresponding to (25). (28)'s causal chain representation is given in (29) and the a-structure to f-structure mapping is shown in (30).

- (28) a. The door was opened by Jack.
 b. The door was opened.



Note that the causal chain representations of (25) and (28) are the same. This shows that the difference between the active and passive is not a difference in the conception of the causal structure of the event but a difference in the a-structure. (28b) shows that the by-phrase of passives ('by Jack') is optional: this means it is either an a-adjunct or an adjunct. Because the tests we applied to instruments in Section 2.4 to determine whether an item is an argument, a-adjunct or adjunct applied to by-phrases of passives yield the same results, we can say they are a-adjuncts, and hence represented on the 2nd tier.

In (30) we see that the 1st tier proto-agent is demoted to the 2nd tier and from there mapped to OBL_{AG}. It is demoted to the 2nd tier because it is optional: if it remained on

the 1st tier it would be obligatory, which is incorrect, or if it were deleted, it would not be optional, which is also incorrect.

3.8 A Brief Comparison with Japanese and the Universality of Causal Chains

In this section, I shall show a little of how instruments pattern in Japanese. I shall argue that the differences between English and Japanese regarding instruments are grammatical and not conceptual, and that causal chains are universal.

It is important to distinguish the conceptual aspect of what we have seen from the grammatical. As mentioned above, causal chains are part of the conceptual structure that linguistic constructions are sensitive to. A-structure is a part of the grammar and so a part of a language and is sensitive to certain information passed to it by the causal chain (also to other parts of conceptual structure, but we are not concerned with those here). Viewing things in this way, an interesting consideration is how instrument alternation differs cross-linguistically. Consider the following data, basically the same two core sentences and their alternations (1a-b) and (2a-b) of Subsection 2.3.1, but in Japanese.

- (31) a. Jack wa/ga kagi de doa o aketa.
Jack TOP/NOM key with door ACC open-PST
“Jack opened the door with the key.”
- b. *kagi wa/ga doa o aketa.
key TOP/NOM door ACC open-PST
“The key opened the door.”
- (32) a. Emi wa/ga fooku de pasuta o tabeta.
Emi TOP/NOM fork with pasta ACC eat-PST
“Emi ate the pasta with a fork.”
- b. *Fooku wa/ga pasuta o tabeta.
fork TOP/NOM pasta ACC eat-PST
“The fork ate the pasta.”

The difference between English and Japanese is clear: neither type of instrument in Japanese can be realized as subject. A noun in Japanese cannot be case marked as both subject and instrument, and this is why (33) is ungrammatical as the ‘key’ is marked for both.

- (33) *kagi de ga doa o aketa.
key TOP door ACC open-PST
“The key opened the door.”

However, if the ‘key’ is marked as an instrument with *de* it can still be topicalized (*wa* is not a case particle but a topic marker).

- (34) kagi de wa doa o aketa.
The key NOM door ACC open-PST
“It is the key that opened the door.”

This instance of *wa* is contrastive¹²; i.e. it is with this ‘key’ and not something else or another key that the door could be opened. It is important to note that ‘kagi de’ is not the subject in this sentence but simply the topic. Topics can be subjects, and this is the case where *wa* is used in (31a) and (32a) above; the nouns are topic marked, but they are also subjects. But as can be seen from (31b) and (32b), when that noun is an instrument marked as topic *and also functioning as the subject* the sentence is ungrammatical. In short, instruments can be topicalized but they cannot be the subjects of sentences in Japanese; this clearly differs to English.

The sentence in (35) is also good:

- (35) kagi de doa o aketa.
key with door ACC open-PST
“[Someone] opened the door with the key.”

¹² We saw in Section 2.3.3 that Alexiadou & Schäfer (2006) proposed some English examples with instruments as subjects require a contrastive reading. Although I argued against their analysis, it is interesting to note that contrastiveness arises again with instrument constructions.

but is clearly a case of subject pro-drop and not equivalent to (34). (35) is more akin to (36):

(36) He/She opened the door with the key.

where, without an appropriate context, we do not know who opened the door with the key. (35) clearly lacks an overt topic or subject: no noun is marked for topic or subject.

The case of Japanese is relevant to the *cognitive* nature of Croft's model. We do not want to claim that Japanese speakers cognitively conceptualize the event described in English as (1a) of Subsection 2.3.1 or in Japanese as (31a) differently, but that the respective grammars of the languages are different. That conceptualization is uniform across humans but different languages' grammars permit different linguistic constructions representing those conceptualizations is a well supported hypothesis in the psycholinguistic literature (see, e.g., Bowers et al (1999), Vigliocco et al (2002)). Although Croft (1991) does not go into detail about the relationship between cognition and grammar, I take the line that his cognitive model must be encoded into a grammar that results in sentences so that, amongst other things, we can deal with the English-Japanese discrepancy. Croft identifies the cognitive embedding of causality and himself says:

“This tremendous complexity of causal structure in human experience must be simplified into verbs and thematic roles, that is, the predicate-argument structure of a clause.”

(Croft 1991: 177)

The predicate-argument structure for us here is a-structure. The idea is that the causal chain is represented in the same manner in both English and Japanese speakers but the rules of a-structure allow for different mappings and thereby different surface

realizations and restrictions in the two languages. To conclude this point, I quote from Schlesinger:

“Language has rules stating how meanings are expressed by linguistic constructions; or, put differently, grammar describes the (often complex and indirect) mappings from cognitive space into syntactic structures.”

Schlesinger (1995: 1)

3.9 Summary

In this chapter, I first outlined the LFG standard a-structure system and then gave three deficiencies of it related to instrument constructions. The first of these, that the LFG standard a-structure system does not account for the optionality of instruments, has been shown not to be a problem for the a-structure proposed here through use of the 2nd tier. The third, that the relationship between agent and instrument is not captured by thematic roles and the feature system employed by the LFG standard a-structure system, was shown to be avoided in the current system by the use of proto-roles. We shall see how the current a-structure system avoids the second criticism in Subsection 4.2.1.1.

I introduced the apparatus we will use to analyse instrument constructions. I explained Croft’s (1991) **causal chains** and introduced the concept of **causal force** and adapted Talmy’s (1988) **onset causation** and **extended causation**, showing how these three concepts are used within causal chains to deal with instruments. I outlined Dowty’s (1991) **proto-roles** and showed how they are related to and informed by the causal chain. In turn, I proposed that the concepts of causal force, onset causation and extended causation are information passed to the a-structure which is relevant for linguistic constructions involving instruments; we shall see this in the next chapter.

Through looking at some Japanese examples, I suggested that causal chains are a part of conceptual structure and are cognitively universal, whereas different languages' a-structures permit different linguistic alternations and hence a-structure is a part of the language's grammar.

4 The Instrument as Subject Construction

4.1 Introduction

In Chapter 2, we saw that intermediary instruments can be realized as subjects whereas facilitating instruments cannot. In Chapter 3, I presented the apparatus that I will use to analyze two instrument constructions. In this chapter, we will see that apparatus used to analyze the instrument as subject construction and account for intermediary and facilitating instruments.

4.2 The Instrument as Subject Construction in Causal Chains

4.2.1 Distinguishing Intermediary and Facilitating Instruments

4.2.1.1 The Role of Causal Force in the Instrument as Subject Construction

We are now in a position to explain why intermediary instruments can be realized as SUBJECTs and why facilitating instruments cannot. The claim I want to make is that intermediary instruments possess the proto-agent property *causal force* but facilitating instruments do not. This is a slight departure from Dowty who classifies all instruments as proto-agents that possess the proto-agent properties *movement* and *causal force* but not *volition* or *sentience* (Dowty (1991: 577)) – of course this does not differentiate the two types of instrument. As we are now following the idea that only *intermediary* instruments have the property *causal force*, facilitating instruments will possess *movement* only. The conceptual merit of this approach can be seen in the light of some examples.

- (1) a. Jack opened the door with the key.
b. The key opened the door.
- (2) a. Emily devoured the pasta with the fork.
b. *The fork devoured the pasta.

The above are examples from Section 2.3. Conceptually, ‘the key’ in (1) is necessary to bring about the opening of the door (assuming it is locked), whereas ‘the fork’ in (2) is not necessary to bring about the devouring of the pasta – clearly ‘the fork’ moves independently of another participant (‘the pasta’) in the event and so possesses the proto-agent property *movement*, but conceptually ‘the fork’ is not causally connected – it is quite literally “facilitating”.

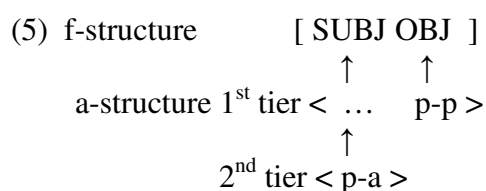
Consider also the following examples for further illustration.

- (3) a. Kevin lifted the hay with the fork lift truck.
b. The fork lift truck lifted the hay.
- (4) a. Kevin lifted the hay with the pitchfork.
b. *The pitchfork lifted the hay.

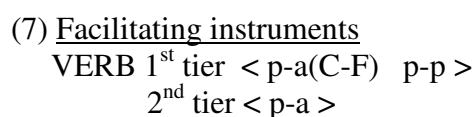
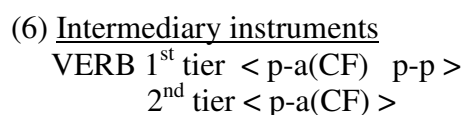
Machines acting as instruments often clearly show the possession of *causal force* as their role in bringing about the event is often fundamental. In an example like (3), the instrument ‘the fork lift truck’ is in part causally responsible in the conceptualisation of the event for bringing about the result state. ‘The pitchfork’, on the other hand, relies on an agent wielding it to bring about the result state. Hence ‘the fork lift truck’ but not ‘the pitchfork’ possesses *causal force*. This information is passed to the a-structure. It is important to note in these examples that the grammaticality of the instrument as subject construction has nothing to do with the verb or direct object – and hence not the VP either – or the agent: (3) and (4) are a minimal pair. It is the conceptualization of the instrument itself that is responsible for grammaticality, and this supports my analysis that the instrument’s possession of *causal force* or otherwise is the crucial factor in permitting the instrument as subject construction.

The proposal here is hence that only instruments that possess *causal force* (what have been termed intermediary instruments) can be realized as SUBJ and thereby permit the instrument as subject construction. Further conceptual merit for this claim comes from the following consideration. The verbs we have seen depict a change of state¹³ in or for the L-OBJECT (we are not dealing e.g. with experiencer psych-verbs here such as ‘fear’ and ‘worry’). This change of state must be *caused* in some way, and that cause must be brought about by one or more elements in the Antecedent of the causal chain. It is therefore quite understandable that to express such events linguistically at least one of these elements needs to possess *causal force* and appear in the linguistic construction. Linguistic construction here includes the a-structure: this means that one of the elements must appear in a-structure. As the causal chain passes information to the a-structure, this requirement will be satisfied. For a passive, when the agent is demoted to the 2nd tier, the element possessing *causal force* may not appear in the surface sentence, but being in the causal chain and the a-structure, it is both semantically and syntactically implied. For the instrument as subject construction, the element possessing *causal force* must be realized in the surface sentence for the construction to be grammatical. This is because, I propose, due to the different degrees of causation encoded by different constructions, an idea I develop in Subsection 5.4.2. In cases like (1a) and (3a), both the agent and the instrument possess *causal force* – this means that (1b) and (3b) are grammatical because, with the *deletion* of the agent in the a-structure, there is still an element from the Antecedent present (i.e. the instrument) that possesses *causal force*. This element, a proto-role is promoted from the 2nd tier and then mapped to SUBJ as shown in (5). The dots in the 1st tier represent that the 1st tier proto-agent has been deleted.

¹³ ‘Eat’ and possibly ‘devour’ are different in that they are not ‘causal verbs’ and so cannot be conceptualized in terms of causal chains; this will be briefly discussed in Section 4.3 below.



For (2a) and (4a), grammaticality results because the agents possess *causal force*. However, the instruments do not possess *causal force*, and this is why, with the deletion of the agents in (2b) and (4b), ungrammaticality results. This difference is represented in (6) and (7):



This shows how the difference between intermediary and facilitating instruments is captured in the current system and hence how the second criticism I levelled at the LFG standard a-structure system is avoided.

4.2.1.2 The Role of Onset Causation and Extended Causation

Recall from Section 2.3 that one kind of instruments that can be licensed as subjects for Alexiadou & Schäfer (2006) (following Kamp & Rossdeutscher (1993)) was causer-like instruments, which are involved in an event without being (permanently) controlled by an agent. Causer-like instruments have a kind of causal independence from the agent. I equate this observation with the contrast between onset causation and extended causation (see Subsection 3.5.1.2). My claim is that those instruments that can be licensed as causer-like instruments feature in causal chains with onset causation. Thus if we revisit this pair of examples:

- (8) a. The doctor cured the patient with the scalpel.
 b. *The scalpel cured the patient.

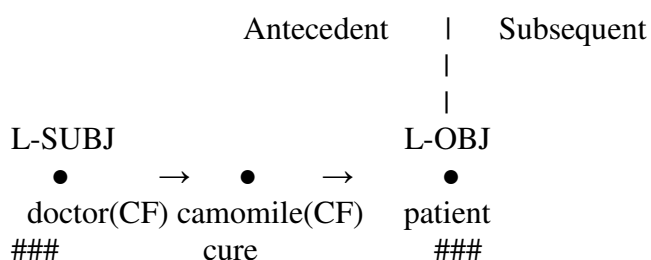
- (9) a. The doctor cured the patient with the camomile.
 b. The camomile cured the patient.

Modified from Alexiadou & Schäfer (2006: 42)

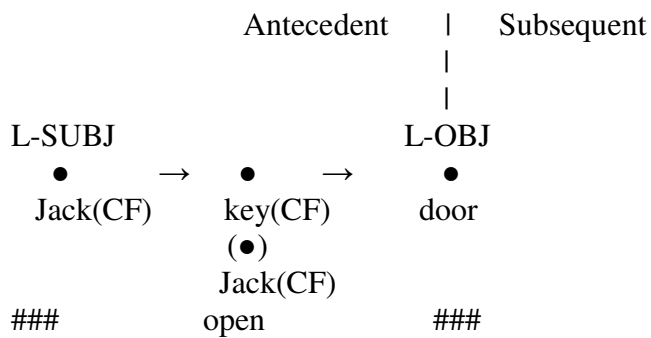
we can now say that, under the analysis using causal chains, (9b) is grammatical because the instrument in the causal chain is conceptualized under onset causation and, my claim is, whenever there is a case of onset causation the instrument possesses *causal force* and therefore the instrument as subject construction is permitted. ‘The scalpel’ in (8b), on the other hand, is conceptualised under extended causation, and in such a situation, the instrument *may or may not* possess *causal force*. Only if it possesses *causal force* will the sentence be grammatical. In (8b), we can see conceptually that the instrument ‘the scalpel’ does not possess *causal force* as the agent, ‘the doctor’, is conceptually the primary causer in wielding ‘the scalpel’ to bring about the VP denoted event of curing the patient, and this accounts for (8b)’s ungrammaticality.

This proposal can be represented in causal chains as follows. (9a) is represented in (10). Recall the following causal chain (11) from Section 3.5.1.2, but with the proto-agent property *causal force* added where possessed by a proto-agent. The causal chain for (8a) is given in (12) below.

- (10) The doctor cured the patient with the camomile.

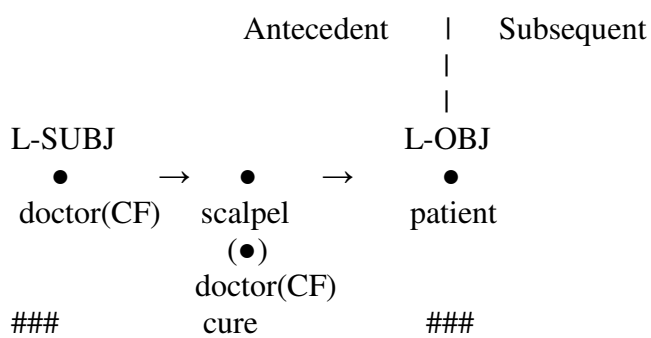


(11) Jack opened the door with the key.



The claim is that the 1st tier proto-agent (agent or instrument) mapped to SUBJ must possess *causal force* in the instrument as subject construction. In (10), we see an example of onset causation, where the L-SUBJ causes the instrument to then causally affect the L-OBJ. As such, there is no overlap in causation¹⁴. Both agent and instrument possess *causal force*. In (11), we see an example of extended causation, where the agent/L-SUBJ and instrument causally act together to bring about the change in the L-OBJ. Again, both agent and instrument possess *causal force*. But now consider (12):

(12) The doctor cured the patient with the scalpel.



Here, again, we have an example of extended causation, but, in this case, only the agent/L-SUBJ possesses *causal force*. With the absence of the agent/L-SUBJ in a-

¹⁴ This clearly shows the connection with Kamp & Rossdeutscher's (1993) and Alexiadou & Schäfer (2006) notion of causal independence (Section 2.3.3).

structure through deletion, the instrument proto-agent is mapped to SUBJ, but in not possessing *causal force* results in ungrammaticality as evidenced by (8b). Although the agent is semantically implied, this is not enough. The a-structure of the ungrammatical case of (8b) is represented in (13).

(13) f-structure [SUBJ OBJ]

a-structure 1st tier <~~p-a~~ p-p >

2nd tier < p-a >

The line struck through the 1st tier proto-agent shows it has been deleted. The only proto-role which *could* possess *causal force* remaining in the a-structure that could be mapped to subject is the 2nd tier proto-agent; in the case of (8b), it does not possess *causal force* and so the instrument as subject construction is not possible.

It is not satisfactory to claim that for all cases involving extended causation the instrument as subject construction is not permitted as examples (14) and (15) show. This point is related to Alexiadou & Schäfer's (2006) failed attempt to explain "the other way" to license instruments as subjects, namely agent-like instruments.

- (14) a. Jack opened the door with the key.
b. The key opened the door.

- (15) a. Ashley cut the melon with the knife.
b. The knife cut the melon.

- (16) a. Cathryn ate spaghetti with a fork.
b. *The fork ate spaghetti.

- (17) a. Ed wrote the letter with the pen.
b. *The pen wrote the letter.

Cf Alexiadou & Schäfer (2006: 44)

Recall that (17) was the example I thought was problematic for Alexiadou & Schäfer (2006), the problem being for their analysis that it is not clear why there is not a salient property of the subject relevant to the event designated by the VP in (17b). All the examples in (14)-(17) involve extended causation, yet the instrument as subject constructions in (14b) and (15b) are grammatical whereas those in (16b) and (17b) are not. (16b) can be accounted for because, as argued above, ‘the fork’ does not possess *causal force* and is conceptualised as merely facilitating Cathryn’s eating of the spaghetti. But – and this is why (17b) is problematic – I think it is much more difficult to conceptualize ‘the pen’ in (17b) in such a way. ‘The pen’ is essential for Ed to write the letter and so can be argued to possess *causal force* in bringing about the event denoted by the VP of ‘writing the letter’. We can say the same thing of both ‘the key’ in (14) and ‘the knife’ in (15). The explanation for the ungrammaticality of (17b) rests, I propose, in a restriction placed on the SUBJ by the VP.

4.3 A Restriction on the SUBJECT

I showed above that the proto-agent properties of the instrument independent of the VP and the agent play a crucial role in permitting the instrument as subject construction. We shall now see that the event denoted by the VP places its *own independent* demands on its SUBJECT. Again, it is not clear what constitutes a sufficient salient property of the subject for Alexiadou & Schäfer (2006), but some of the properties the subject has does seem to matter to the VP. Corresponding to (14)-(17), the following events are denoted by the VPs:

- (18) $\lambda x \lambda e$ [open.the.door(e) & agent(e, x)]¹⁵
- (19) $\lambda x \lambda e$ [cut.the.melon(e) & agent(e, x)]
- (20) $\lambda x \lambda e$ [eat.the.spaghetti(e) & agent(e, x)]
- (21) $\lambda x \lambda e$ [write.the.letter(e) & agent(e, x)]

¹⁵ This loosely follows Parsons’ (1995) set up.

(18), for example, says there is an “opening-the-door” event and an agent is required to complete the sentence. The idea is that the event denoted by the VP places restrictions on the agent. For (18), it has to be conceivable that the agent can open doors, and for (19), it has to be conceivable that the agent can cut melons. A key and a knife are conceivable, respectively. Human agents are also conceivable for both, not because of the properties they possess but because of their capacity to manipulate other instruments. This is a point on which Alexiadou & Schäfer (2006) make a mistake: there is not a common property that make suitable agents for, e.g., (15)/(19) otherwise we would have to say that, for (15), ‘Ashley’ and ‘knife’ both possess the suitable salient property of ‘sharpness’. For (16)/(20) and (17)/(21), the ungrammatical cases, the situation is different. The “eating-the-spaghetti” event requires an agent that can eat. The restrictions here are more complicated: to eat, the agent needs to have an orifice and a digestion system: this means that only human or animal agents will be suitable. ‘Fork’, therefore, is not. “Writing-the-letter” is similar: to write a letter, an agent that commands language with a volitional mind is required: only human agents are suitable. Any other agent for (17)/(21) results in ungrammaticality – we can say that if speakers find ‘computer’ or ‘robot’ acceptable here then their conception of the computer attributes human-like A.I. to it.

To show that the requirement is made by the VP and is not a problem with the particular object being an instrument *per se*, consider the following examples:

(22) The fork cut the melon.

(23) a. Tom lit the dark corridor with the torch.
b. The torch lit the dark corridor.

(24) a. Tom saw the cat with the torch.
b. *The torch saw the cat.

(22) shows that ‘fork’ can be an instrument as subject for (19). (23b) shows ‘the torch’ can be an instrument in subject position, and so (24b) shows that it is the VP itself that is placing an independent restriction on its SUBJ.

To show that it is the VP and not just the verb that restricts the subject, compare the following example with (17b):

(25) The/this pen writes smoothly.

The ‘event’ denoted by the VP in (25) requires a subject that can write smoothly, and it is conceivable that a pen can do this. (Although I commented above that Alexiadou & Schäfer’s (2006) restriction that all such examples demand a contrastive reading is too strong, (25) does benefit from such a reading, and the demonstrative is preferable to the definite article here.) To generalize the restriction being placed on the SUBJ here by the VP I propose the **Animacy Condition**: the subject must be [+ANIMATE].

4.4 The Animacy Condition

A body of research has shown that the animacy of linguistic items affects grammaticality; for example, Dahl & Fraurud (1996:47) state: “Animacy, or the distinction between animate and inanimate entities, is so pervasive in the grammars of human languages that it tends to be taken for granted and become invisible”. In the functional typological literature (e.g. Comrie (1989), Yamamoto (1999)), animacy is often characterized as a three-step scale:

(26) human > animals (animate) > inanimate

An example of this animacy scale (or hierarchy) influencing grammar can be seen by looking at an example from Malayalam. The lower of the two cut-off points in (26)

can be shown to influence the distribution of object case in Malayalam (Asher & Kumari (1997)). Malayalam is a language with differential object marking in which generally only animate but not inanimate objects are marked with accusative case (see Aissen (2003) for a general discussion of differential object marking). The contrast between (27) and (28) illustrates this as the direct object ‘cow’ in (27) occurs in the accusative case whereas the inanimate direct object ‘book’ in (28) does not.

(27) Avan oru paRuvine va i.
he a COW.ACC buy.PST
‘He bought a cow.’

(28) Avan pustakam vaayiccu.
he book read.PST
‘He read the book.’

(Asher and Kumari, 1997:203)

I suggest here that sensitivity to animacy also plays a role in restricting grammatical SUBJECTs for a class of verbs. The generalized restriction being placed on the SUBJ here by the VP is, I propose, the following Animacy Condition: the SUBJ must be [+ANIMATE], where this category includes humans and animals. Nilsen (1973: 65) actually suggests that agents have the feature [+ANIMATE] whereas instruments have [-ANIMATE] and that this is one of their central differences. This Animacy Condition is not in the causal chain but stipulated separately to it. Only certain VPs will place this condition on their SUBJ. It overrides the status of the instrument: even when an instrument possesses *causal force*, if the VP requires a [+ANIMATE] SUBJ and the agent/instrument is [-ANIMATE] it will not be realizable as SUBJ. The reason these VPs require a [+ANIMATE] SUBJ is because there is something about the nature of the VPs that require abilities possessed by animate organisms, such as digestive systems (e.g. *eat*) or eyes (e.g. *see*).

Nilsen also proposes that only certain subjects can be intentional in their actions and can have what he terms the feature [INTENT] (Nilsen (1973: 91)). This observation in relation to instruments is also made by Schlesinger (1974; 1989) and corresponds to his Deliberation Constraint, namely that only certain subjects can encode deliberateness and intentionality and that this is relevant to instrument realization. I shall discuss just Nilsen's [INTENT] feature rather than both to avoid covering the same point twice. Consider the following examples.

- (29) a. John broke all of the dishes with a rock.
b. John used a rock to break all of the dishes.
c. The destroyer sank the battleship with a torpedo.
d. *The destroyer used a torpedo to sink the battleship.

Nilsen (1973: 91)

In (29a), 'John' can be [+INTENT] or [-INTENT], but in (29b) 'John' is [+INTENT]. 'The destroyer' in (29c) has to be [-INTENT] and this is why (29d) is ungrammatical (of course, (29d) can be grammatical if 'the destroyer' is metonymic). The [INTENT] feature can also be seen at work in the following example where the subject of (30a) is [+INTENT] but the subject of (30b) is [-INTENT].

- (30) a. John sliced the salami enthusiastically.
b. *The machine sliced the salami enthusiastically.

Nilsen (1973: 94)

Another test that can be used to show that agents are [+INTENT] whereas instruments are [-INTENT] is to add an intentional verb to the sentence, e.g. 'want to'.

- (31) a. Jack opened the door.
b. Jack wanted to open the door.

- (32) a. The key opened the door.
b. *The key wanted to open the door.

As (31b) shows, an agent is grammatical with an intentional verb whereas (32b) shows that an instrument is not.

In the system we are using here, Nilsen's [INTENT] feature can be equated with Dowty's proto-agent property *volition*. Again, this shows how proto-roles can be used to capture the differences between agents and instruments. Recall Dowty's view that instruments have the proto-agent properties *causal force* and *movement* without *volition* or *sentience*, although we have modified this slightly by stipulating intermediary instruments, but not facilitating instruments, possess *causal force*. We can say that agents can possess *volition* (although they do not have to) whereas instruments cannot. If a VP requires its SUBJ to have *volition* then clearly instruments cannot be SUBJ. Interestingly, some VPs that do not require their SUBJ to possess *volition* normally seem to do so when an instrument is added to the construction.

- (33) a. Rod saw the building go up in flames.
b. Rod saw the building go up in flames with the binoculars.

In English, it is accepted that verbs of seeing like 'watch' and 'look at' are always intentional whereas 'see' can be intentional or passive. In (33a), 'Rod' can be intentionally looking at the building, or he can simply be conscious with his eyes open and the building can be in his field of vision. In (33b) however, the intuition is that 'Rod' cannot passively and unintentionally be looking through the binoculars, and even if he is not looking at the building specifically, there is still an element of *volition* in his action.

There are some good arguments therefore to adopt an analysis that uses an [INTENT] feature or the proto-agent property *volition*. Indeed, using the proto-agent property *volition* instead of [ANIMACY] fits more parsimoniously into the current system.

However, there are three reasons to choose the Animacy Condition instead of a volition/intention condition. Firstly, it is not straightforward to claim that, for some verbs such as *see* as exemplified in (33), the introduction of an instrument into the causal chain forces the verb to restrict its SUBJ to have the property *volition*. It would be more plausible if it were the case that the introduction of an instrument into the causal chain forced all verbs to place a volition requirement on their SUBJs as then we could motivate this by saying, e.g., this is a way for the causal chain to distinguish the agent and instrument in terms of their proto-role properties. The problem is that the introduction of an instrument only places a condition on the SUBJ of *some* verbs: many verbs as we have seen (e.g. *open, solve, break*) allow instrument introduction and allow these instruments to be SUBJs without *volition*. Thus the restriction seems to be more about the verb itself than the presence or absence of an instrument in the causal chain. This is related to the second reason: verbs that restrict instruments as SUBJ seem to always restrict their SUBJ. Consider *see*:

- (34) a. Erica / a man / the cat / saw the sea.
b. *The telescope / the camera / the magnifying glass saw the apple.

Admittedly all the SUBJs in (34b) can be construed as instruments, but the point can still be made that only nouns that are [+ANIMATE] can be SUBJ of a verb such as *see* with or without an instrument in addition to the agent.

The third and final reason is that not all verbs are causal and conceptualized in the causal chain, and such verbs that allow instruments do not allow them to be realized as SUBJ. ‘Eat’ is one such example. Jackendoff (1990: 253) represents ‘eat’ as a causative predicate, but Grimshaw (2005: 85-86) convincingly argues against this categorization. She observes that ‘eat’ lacks an inchoative counterpart, something

very common for causative verbs, and its object argument is not obligatory, a fact at odds with causative verbs.

(35) a. The girl ate the meal.

b. *The meal ate.

c. The girl ate.

(36) a. The girl melted the ice.

b. The ice melted.

c. *The girl melted (where it is intended to mean that the girl melted something).

Modified from Grimshaw (2005: 86)

In (35), we see Grimshaw's observations for 'eat' attested. In (36), containing a typical causative verb 'melt', we see that the inchoative alternation is fine ((36b)), and that the object cannot be omitted in the causative form ((36c)). Grimshaw suggests that 'eat' gets its causative flavour not from its lexical representation or linguistic properties but from its conceptual aspects in the kind of events it typically describes. If this analysis is right, then we cannot appeal to causal chains and their properties to deal with the ungrammaticality of examples like (37).

(37) *The fork ate the pasta.

'Devour' may or may not be a causal verb. Conceptually it is similar to 'eat', but its linguistic properties are different: it does not allow the omission of its object, although it does not have an inchoative form either. Nevertheless, there are good reasons to support the claim that animacy is outside the causal chain, and as such this condition can be applied to non-causal verbs (i.e. those verbs that do not have a causal chain conceptual representation).

Another nice thing is that animacy implies the possibility of *volition*. Indeed, inanimate nouns cannot have *volition* or be intentional, so animacy is not only a better

explanation as it captures more fully verbs such as ‘see’ that can be both intentional and unintentional, but it is also a more encompassing (or ‘general’) generalization.

To give another example for the Animacy Condition also accounts for the following example.

- (38) a. Bob smoked the tobacco with the pipe.
b. *The pipe smoked the tobacco.

In (38), ‘the pipe’ is conceptualized under extended causation and is necessary to the smoking event, so we can say it possesses *causal force* and yet (38b) is ungrammatical. This is because *smoke* places the Animacy Condition on its SUBJ, and there is a natural reason to suppose this: smoking requires a respiratory system, something pipes clearly do not have.

We are also in a position, finally, to explain the ‘write’ example, (17) above, and repeated here as (39).

- (39) a. Ed wrote the letter with the pen.
b. *The pen wrote the letter.

‘Write’ also places the Animacy Condition on its SUBJ. Really it comes down to demanding the writer has *volition* and *sentience* – only such agents can write letters. But as animacy encompasses these, we can again advocate the Animacy Condition. Again, that it is the verb that places the Animacy Condition on the SUBJ is shown by contrasting (39) with (40).

- (40) a. Ed marked the curtain with the pen.
b. The pen marked the curtain.

To make the current proposal more precise, I am claiming that certain verbs place a [+ANIMACY] condition on the argument that is mapped to SUBJ: this means that when the Animacy Condition is not met, the resulting construction will be ungrammatical. This means that if there is an intermediary instrument present as a 2nd tier proto-agent it can be [-ANIMATE] if linked to OBL but not if it is linked to SUBJ. For example, the torch may be an intermediary instrument in (23) and can be linked to OBL as in (24a), but cannot be linked to SUBJ as shown by (24b) due to the Animacy Condition placed by ‘saw’ on its SUBJ.

The Animacy Condition cannot be what Alexiadou & Schäfer (2006) mean by a property that relates the instrument to the verb as that would involve the property of being [-ANIMATE] of the instrument being related to the verb. Instruments do indeed have the property [-ANIMATE], but the problem is how this property would be related to the verb, as really it is a requirement of the verb’s placed on the SUBJ and not a property of the instrument ‘related’ to the verb. Alexiadou & Schäfer (2006: 45) state: “the coming about of the event is crucially dependent on some characteristics of the instrument” – this is what Alexiadou and Schäfer have in mind by ‘property’ and why I think something like conceptual features are a good candidate for what they mean (see Subsection 2.3.4). But it is clear that “the coming about of the event” being “crucially dependent” on the [+/-ANIMACY] property of the instrument would fail to be predictive: all instruments are [-ANIMATE] so either all events or no events should be brought about.

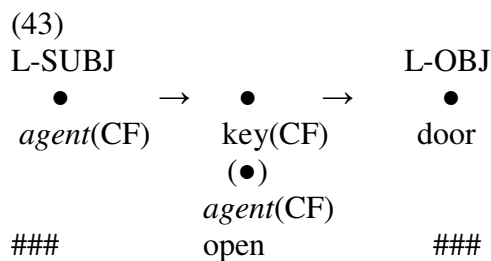
4.5 Mapping from A-structure to F-structure for the Instrument as Subject Construction

In this section, I shall show how the mapping for the instrument as subject construction works. A sample sentence of the instrument as subject construction is (41), where the SUBJ is an instrument.

(41) The key opened the door.

Although there is no agent present in (41), as we saw in Section 3.5, instruments are sequentially second in the causal chain, and an agent is implied *semantically*; it is not, however, *grammatically* available for this construction, so it is not syntactically implied. This fact should be represented in the a-structure. To do this, I propose the instrument as subject construction starts through a causal chain representation as in (43) when the agent is unknown (corresponding to the sentence in (42)).

(42) *agent* opened the door with the key.



The implied agent is information in the causal chain that is passed to the a-structure. This information provides the a-structure with a 1st tier proto-agent which is then deleted. In the absence of a 1st tier proto-agent, but wanting to focus the instrument and its causal force in the event through the instrument as subject construction, the 2nd tier proto-agent argument is promoted to the 1st tier. The diagram in (44) shows this process. The shading represents deletion and the subscripts keep track of which tier the proto-agent is from:

(44)

a. $\text{open } 1^{\text{st}} \langle \text{p-a}_1 \text{ p-p} \rangle$
 $2^{\text{nd}} \langle \text{p-a}_2 \rangle$ → b. $\text{open } 1^{\text{st}} \langle \text{p-a}_1 \text{ p-a}_2 \text{ p-p} \rangle$
 $2^{\text{nd}} \langle \quad \rangle$ → c. $\text{open } 1^{\text{st}} \langle \text{p-a}_2 \text{ p-p} \rangle$
 $2^{\text{nd}} \langle \quad \rangle$

The absence of the proto-agent 1st tier argument means the proto-agent 2nd tier argument is promoted to the 1st tier due to the causation encoded by the transitive verb *open*: a 1st tier proto-agent with *causal force* is required. This proto-agent argument is then mapped to SUBJ and allows for grammatical sentences such as (41). This point also illustrates why facilitating instruments cannot be realized as SUBJECTs in the instrument as subject construction: in lacking *causal force*, the requirement that such transitive verbs require a proto-agent with *causal force* to be mapped to SUBJ is violated.

For comparison and clarity, let us see how the mapping looks for a standard transitive verb with instrument such as in (45).

(45) Jack opened the door with the key.

(46) f-structure [SUBJ OBJ OBL_{INS}]
a-structure 1st tier < p-a p-p >
2nd tier < p-a >

‘Jack’ is the 1st tier proto-agent, ‘the door’ is the 1st tier proto-patient, and ‘the key’ is the 2nd tier proto-agent. Recall that 2nd tier proto-roles are optional, and this is born out by the fact that ‘Jack opened the door’ is grammatical. As the agent ‘Jack’ is the initial causer in the causal chain he is conceptually the primary causer, and it is this fact that puts the instrument on the 2nd tier.

Let us repeat the mapping here for the instrument as subject construction. The initial proto-agent argument on the 1st tier has been deleted.

(47) The key opened the door.

(48) f-structure [SUBJ OBJ]
 ↑ ↑
 a-structure 1st tier < ... p-p >
 ↑
 2nd tier < p-a >

The grammatical operation shown in (44)/(48) does not optionalize the proto-agent argument in any way; it is deleted, and the transitive verb still requires a SUBJ and an OBJ. That the original 1st tier proto-agent is not moved to the 2nd tier and optionalized (what I term demoted) but deleted correctly rules out ungrammatical sentences such as (49).

(49) *The key opened the door by Jack.

The proto-agent argument from the 2nd tier moves up to the slot on the 1st tier and is mapped to SUBJ. If it remained on the 2nd tier and was mapped to SUBJ from there it would be optional, which would incorrectly predict (50) to be grammatical.

(50) *opened the door.

If the 1st tier proto-patient is mapped to subject we get a different construction, as in (51).

(51) The door opened (with the key).

Here, the verb encodes unaccusativity and expresses a lower degree of causation requiring its SUBJ to be a proto-patient. This construction is the topic of Chapter 5.

The mapping rules for the instrument as subject construction are given in (52).

(52) Mapping Rules for the instrument as subject construction

[1st tier proto-agent deleted]

1st tier proto-patient > OBJECT

2nd tier proto-agent > 1st tier > SUBJECT

4.6 Summary

In this chapter I have shown how, using the apparatus introduced in Chapter 3, the instrument as subject construction is accounted for. One key point is, for causal verbs, the 1st tier proto-agent must possess *causal force*. I argued that causal chains with instruments conceptualized under onset causation always possess *causal force*. For causal chains with instruments conceptualized under extended causation, this may or may not be the case. If it is, the instrument as subject condition is possible as we have an intermediary instrument. If it is not the case, the instrument as subject condition is not possible as we have a facilitating instrument.

I also argued that, independent of the causal chain, some verbs place an Animacy Condition on their SUBJ that requires the SUBJ to be [+ANIMATE]. This Condition overrides the information passed to a-structure by the causal chain.

The a-structure system presented here accounts for the two types of instrument, how instruments are optional, and the instrument as subject construction, and so has these advantages over the LFG standard a-structure system (see Section 3.2).

The following is a summary of the results showing these conditions.

(53) Conditions affecting the instrument as subject construction in the causal chain

(1) Onset causation (instrument will always possess <i>causal force</i>)	IaSC✓
(2) Extended causation	(a) Instrument possesses <i>causal force</i> IaSC✓
	(b) Instrument does not possess <i>causal force</i> IaSC✗

Key

IaSC = Instrument as Subject Construction

✓ = IaSC possible

✗ = IaSC not possible

Condition (1) is read ‘if the instrument is conceptualized under onset causation, the instrument as subject construction is grammatical’. Condition (2) is read ‘if the instrument is conceptualized under extended causation, then, if the instrument possesses *causal force*, the instrument as subject condition is grammatical, and if the instrument does not possess *causal force*, then the instrument as subject condition is ungrammatical.

Conditions (1) and (2) refer to instruments in the causal chain. As I argued above, these alone cannot account for all the data, and I proposed a third condition, the Animacy Condition. The Animacy Condition is that certain VPs demand their SUBJ be [+ANIMATE]; if the SUBJ is [-ANIMATE], then the instrument as subject construction will be ungrammatical. This condition is outside the causal chain, and hence I have not included it in table (53). The Animacy Condition overrides the causal chain conditions in (53): even if they are met and license an instrument as subject construction, if the Animacy Condition is not met, the construction will be ungrammatical.

The following table summarizes instrument categorization with the proposed conditions for the accounts of Kamp & Rossdeutscher (1993)¹⁶, Alexiadou & Schäfer (2006) and the current one.

(54) Summary of instrument categorization and causal conditions for the instrument as subject construction

	Instrument Type	
	<i>Intermediary</i>	<i>Facilitating</i>
Kamp & Rossdeutscher (1993)	(1) Causal Independence	
Alexiadou & Schäfer (2006)	<i>Causer-like</i> (1) Causal Independence	<i>Agent-like</i> (1) Property/feature Relation
Current Proposal	(1) Onset Causation (2) Extended Causation with <i>causal force</i>	[(1) Causal Dependence] [(1) Causal Dependence or (2) no property/feature relation] (1) Extended Causation without <i>causal force</i>

For the same reason given above regarding table (53), my third condition, the Animacy Condition, is not included in table (54), but it is of course a part of the current proposal.

Alexiadou & Schäfer (2006) (or Kamp & Rossdeutscher (1993)) do not give explicit conditions under which facilitating instruments appear in linguistic constructions, and so I have square-bracketed the assumptions I have made in the table in the relevant cells to reflect this.

As was argued in the previous chapter, there are serious shortcomings with Kamp & Rossdeutscher (1993) and Alexiadou & Schäfer (2006), and it is hoped that the analysis in the current chapter has shown the current proposal to be an improvement.

¹⁶ I did not discuss Kamp & Rossdeutscher's (1993) proposal independently from Alexiadou & Schäfer's (2006) but mentioned it enough in discussing the latter to include it here.

5 The Instrument Unaccusative Construction

5.1 Introduction

There is another construction possible with some but not all intermediary instruments. In these sentences, the proto-patient argument realizes as the subject, and the instrument argument realizes with ‘with’.

- (1) The door opened with the key.
- (2) The paper stuck with the glue.
- (3) The cord cut with the scissors.

In (1)-(3), all the instruments are intermediary and can appear in the instrument as subject construction as subjects with the same verb and with what is the subject in (1)-(3) as object (e.g. ‘The key opened the door’). The puzzle is that not all combinations of intermediary instruments as subjects, verbs and objects that permit the instrument as subject construction permit the construction exhibited in (1)-(3) as the b-sentences here show:

- (4) a. The washing-machine cleaned the clothes.
b. *The clothes cleaned with the washing-machine.
- (5) a. The computer solved the problem.
b. *The problem solved with the computer.
- (6) a. The stereo played the music.
b. *The music played with the stereo.

To my knowledge, this construction and the contrast between (1)-(3) and (4)-(6) has not been observed or discussed in the literature at all. In the literature I have surveyed, I have found only the following two examples: Schäfer (2008: 2) gives this example: “This glass breaks easily with a hammer”, and Chomsky (1972: 170) this one: “The window broke with a hammer.” Chomsky’s example is exactly the construction we

shall look at, while Schäfer's is a little different – it's a middle construction with an instrument (I draw comparisons with middles in Section 5.6). However, neither author draws specific attention to these examples or flags them as a different construction. This is a shame, as there is reason to treat it as a separate construction as shown by (1)-(6), i.e. not all intermediary instruments can be realized in it. It is not straightforward to account for as we shall see, and consequently I shall spend some time discussing it. My proposal is that there are three conditions required for the grammaticality of this construction: first, the instrument must be intermediary; second, the verb must be in the *change of state-transitive counterpart* category of the Unaccusativity Hierarchy; and third, the L-OBJECT proto-patient mapped to SUBJ in this construction cannot possess *incremental theme*. Unfortunately, these three conditions do not fully explain the instrument unaccusative construction, as we shall see, and a complete analysis remains elusive.

5.2 Unaccusatives

The Unaccusative Hypothesis was first formulated by Perlmutter (1978) in the Relational Grammar framework, and has received much attention since (e.g. Burzio (1981), Rosen (1984), Van Valin (1990), Zaenen (1993), Levin & Rappaport Hovav (1995)). The Unaccusative Hypothesis claims that there are two classes of intransitive verbs, unaccusatives (examples in (7)) and unergatives (examples in (8)).

(7) John came / fell / died / disappeared.

(8) Mary ran / danced / swam.

The debate over the Unaccusative Hypothesis has been very lively and both syntactic (e.g. Rosen (1984), Burzio (1986)) and semantic (e.g. Van Valin (1990)) accounts have been proposed. I will not go into the Unaccusative Hypothesis in great detail

here as, firstly, it would take us beyond the scope of this work, and, secondly, it is not necessary for our purposes.

Expressed semantically, unaccusative verbs tend to express a telic and dynamic change of state or location, while unergative verbs tend to express an agentive activity. In simplistic terms of thematic roles, the subjects of unaccusative verbs receive a *theme* thematic role whereas the subjects of unergative verbs receive an *agent* thematic role. The most well-known syntactic test to determine unaccusativity/unergativity is auxiliary selection in languages that use two different temporal auxiliaries (*have* and *be*) for analytic past/perfect verb forms (e.g. German, Dutch, French, Italian). In these languages, unaccusative verbs combine with *be*, while unergative verbs combine with *have* (see e.g. Rosen (1984)).

(9) French:

- a. unaccusative: Je suis tombé.
I am fallen. (= "I have fallen.")
- b. unergative: J'ai travaillé.
I have worked.

This test is unavailable for modern English where both unaccusatives and unergatives take *have*, and the identification of unaccusative verbs in English is based on other criteria. Firstly, many unaccusative verbs participate in the causative/inchoative alternation (see e.g. Levin (1993: 27ff)).

- (10) a. Causative: The sun melted the ice.
- b. Inchoative: The ice melted.

Ergative verbs do not undergo this alternation.

- (11) a. *The man danced the girl.
- b. The man danced.

Secondly, unaccusative past participles can often be used as nominal modifiers whereas unergative past participles cannot:

- (12) a. Unaccusative: the melted snow, the departed guests, the fallen soldiers
b. Unergative: *the shouted victim, *the slept child, *the hesitated leader

Finally, unaccusative subjects can generally be modified by a resultative adjunct (see e.g. Levin & Rappaport Hovav (1995: Chapter 2)). This is a property shared by direct objects and passive subjects, but not shared by the subjects of unergative and transitive verbs.

- (13) a. Unaccusative: The vase broke into pieces.
b. Direct Object: Kieran broke the vase into pieces.
c. Passive Subject: The vase was broken into pieces.
d. Unergative Subject: *Brian danced into a stupor / a stone lighter.
e. Subject of Transitive Verb: *Kerry drank the juice full / a pound heavier.

Now let us consider these tests and the alternation in (1)-(6) with the following verbs.

(14)

a. *open* – The door opened with the key.

Instrument as subject construction: The key opened the door.

Causative/inchoative alternation: The door opened.

Past participle as nominal modifier: ?The opened door. (But: The open door.)

Resultative adjunct: The door opened all the way.

b. *stick* – The paper stuck with the glue.

Instrument as subject construction: The glue stuck the paper.

Causative/inchoative alternation: *The paper stuck.

Past participle as nominal modifier: *The stuck paper.

Resultative adjunct: The paper stuck to form one piece.

c. *cut* – The cord cut with the scissors.

Instrument as subject construction: The scissors cut the paper.

Causative/inchoative alternation: *The paper cut.

Past participle as nominal modifier: ?The cut paper.

Resultative adjunct: The paper cut into three squares.

d. *clean* – *The clothes cleaned with the washing-machine.
Instrument as subject construction: The washing-machine cleaned the clothes.
Causative/inchoative alternation: ?/*The clothes cleaned.
Past participle as nominal modifier: ?The cleaned clothes. (But: The clean clothes.)
Resultative adjunct: ?The clothes cleaned to look brand new.

e. *solve* – *The problem solved with the computer.
Instrument as subject construction: The computer solved the problem.
Causative/inchoative alternation: *The problem solved.
Past participle as nominal modifier: *The solved problem.
Resultative adjunct: *The problem solved to completion.

f. *play* – *The music played with the stereo.
Instrument as subject construction: The stereo played the music.
Causative/inchoative alternation: *The music played.
Past participle as nominal modifier: *The played music.
Resultative adjunct: The music played to the end.

I have assessed these examples as isolated and complete sentences. For example, a Google search for “problem solved” gave 5,180,000 hits (27/03/08) but I could not find a single case of an isolated and complete sentence such as “A/the/this/that problem solved.” Examples were largely of the newspaper headline variety, e.g. “140-year-old math problem solved by researcher” (www.eurekalert.org/pub_releases/2008-03/icl-1yo030308.php 27/03/08) and “Blackberry problem solved – now what?” (blogs.zdnet.com/Greenfield/?p=194 27/03/08). This contrasts with “the door opened” which received 2,130,000 hits on Google (27/03/08) with examples like “The door opened. I looked in.” (www.wordybug.com/TheIron,theSwitchandtheBroomCupboard.htm 27/03/08); and “The door opened and we were allowed inside.” (www.guardianweekly.co.uk/?page=editorial&id=128&catID=6 27/03/08).

We can see from (14a-f) that there is no pattern in terms of the tests for unaccusativity given above that coincides with permitting the construction given in (1)-(3). In

general, resultative adjuncts tend to improve what would otherwise be inchoatives, but the only verb of those shown that looks like an unaccusative is *open*.

Despite unaccusativity seeming to be unhelpful for our purposes, a more sophisticated approach proves to the contrary. Sorace (2000) proposes the Auxiliary Selection Hierarchy, which is recast and slightly modified as the Unaccusative Hierarchy by Kluender (2004). The Unaccusativity Hierarchy proposes degrees of unaccusativity rather than a binary distinction between unaccusatives and unergatives. Adopting the Unaccusative Hierarchy allows us to attempt a more sophisticated analysis along unaccusative lines.

(15) The Unaccusative Hierarchy

<u>Thematic/Aspectual Categorization</u>	<u>English Examples</u>
(selects BE)	
<i>Change of location</i>	arrive, fall
<i>Change of state/condition</i>	become, disappear, die
<i>Continuation of a pre-existing state</i>	stay, remain
<i>Existence of a state/condition</i>	be, seem
<i>Change of state-transitive counterpart</i>	break, melt
<i>Uncontrolled process</i>	blush, tremble, shine
<i>Controlled process (motional)</i>	run, dance, swim
<i>Controlled process (non-motional)</i>	talk, work
(selects HAVE)	

Kluender (2004: 29-37)

At the top of the table are clear-cut unaccusative verbs, while at the bottom are clear-cut unergatives; although, for my judgements at least, not all the clear-cut unaccusatives pass all unaccusativity tests. The issue of adequate tests aside – and for our purposes it is not crucial – we see that verbs that tend to allow the construction in (1)-(3) are in the *change of state-transitive counterpart* category, that is, verbs that exhibit a change of state and have a transitive counterpart. That having a transitive counterpart is relevant we see that, although the unaccusative/unergative distinction

characterizes intransitives, talking of the unaccusativity and unergativity encoded in transitives is not inappropriate, and my discussion shall involve this idea. The verbs that allow the construction in (1)-(3) hence fall part way between clear-cut unaccusatives and clear-cut unergatives. I would like to suggest the following reasoning for this: the subject of the construction in (1)-(3) is clearly an undergoer of the verb and not an agent, and yet the instrumental with-phrase contains a notion of transitive causation: the undergoing of the subject is in part brought about due to the instrumental with-phrase. A comparison of three verbs, *arrive* (clear-cut unaccusative), *break* (change of state-transitive counterpart) and *talk* (clear-cut unergative) illustrates this.

(16) *arrive*

- a. The boy arrived.
- b. *The boy arrived with the train¹⁷.
- c. The boy arrived on the train
- d. *The train arrived the boy.

(17) *break*

- a. The window broke.
- b. The window broke with the rock.
- c. The rock broke the window.

(18) *work*

- a. The girl worked.
- b. The girl worked with the calculator.
- c. *The calculator worked the girl.

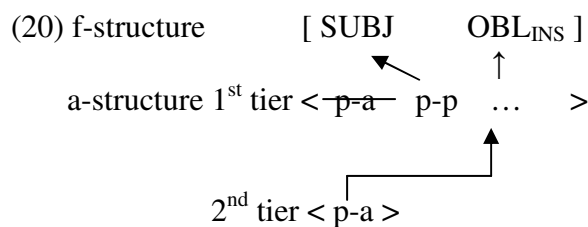
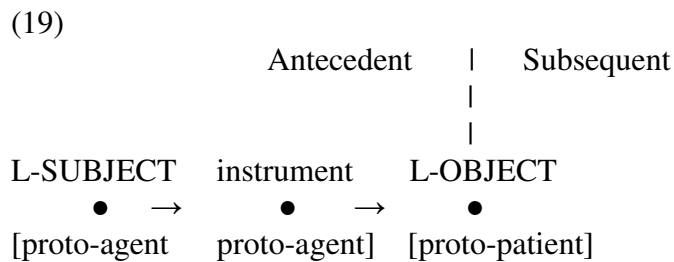
Clearly, the clear-cut unaccusative and clear-cut unergative cannot realize their instruments as subjects in the instrument as subject construction ((16d) and (18c) respectively). The clear-cut unergative can occur with instruments as (18b) shows, but only a facilitating one. The clear-cut unaccusative cannot occur with an instrument with 'with' ((16b)) but can if the preposition is 'on' ((16c)), although I will not pursue

¹⁷ (16b) is ungrammatical where 'with the train' receives an instrument and not an accompaniment reading (see Section 2.2.)

this here (see Levin (1979) for a comparison of instruments taking ‘with’ and those taking ‘on’). The fact that the instrument with the clear-cut unaccusative cannot occur as subject in the instrument as subject construction again argues that it is a facilitating instrument. The verb *break*, in the change of state-transitive counterpart category, takes an intermediary instrument in (17) and permits the instrument as subject construction ((17c)) and the alternation exhibited in (1)-(3) ((17b)). The subject ‘window’ in (17a and b) and the object ‘window’ in (17c) undergo a change of state, unbroken to broken, and the instrument ‘rock’ in (17b and c) is an intermediary one in the causal chain at least partly responsible for bringing about this change, i.e. it possesses *causal force*.

This explains the unacceptability of (4b), (5b) and (6b) in the following way: the verbs *clean*, *solve* and *play* are not in the change of state-transitive counterpart category, but further down the scale towards unergativity, let us say in the controlled process (motional) and controlled process (non-motional) categories. Hence their subjects cannot be undergoers of the verb and they consequently do not permit the alternation in (1)-(3). They have a transitive counterpart however that encodes causation and this allows them to permit the instrument as subject constructions. Of course, these verbs are technically not in the Unaccusativity Hierarchy because it is for intransitive verbs; but, as mentioned above, in allowing one category to be sensitive to transitivity, namely *change of state-transitive counterpart*, I do not think it is inappropriate to extend the notion of encoding unaccusativity and unergativity to transitive verbs and see where they would appear in the Unaccusativity Hierarchy. Following this link with unaccusativity, I shall label the alternation in (1)-(3) the **instrument unaccusative construction**.

This explanation can be captured straightforwardly from the apparatus we have seen and used in the previous chapters. The instrument of the instrument unaccusative construction must be an intermediary one, so it must be in the causal chain: this is the first condition. The second condition is that the verb used must be unaccusative to a degree that allows its subject to be an undergoer; or, in our terms, it must be unaccusative to a degree to allow the L-OBJECT (which will be a proto-patient) to be linked to SUBJ. It is not that the verb must be *highly* unaccusative; i.e., it need not permit the L-OBJECT/proto-patient to be linked to SUBJ with the *absence* of a proto-agent linked to OBL₀: a verb such as *open* can do this, but verbs like *cut* and *stick* cannot. The unaccusativity encoded by the verb means it wants a proto-patient SUBJ. This means the 2nd tier proto-agent when promoted to the 1st tier is forced behind the proto-patient (cf. the ordering of the proto-roles for the instrument as subject construction in Section 4.5). (19) shows the required causal chain, and (20) shows the mapping algorithm for the instrument unaccusative construction.

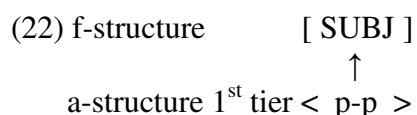


The 1st tier proto-agent is initially present because there is an implied agent in the causal chain. The line struck through the 1st tier proto-agent argument represents that

it is deleted, *not demoted*, and hence cannot appear in the instrument unaccusative construction. This correctly rules out the cases in (21):

- (21) a. *The door opened with the key by Jack.
 b. *The door opened by Jack with the key.
 c. *The paper cut with the knife by Fred.

In addition, the 2nd tier proto-agent must move to the 1st tier first before being mapped to OBL_{INS} as it is not an optional argument – this correctly rules out the causative/inchoative alternation constructions of (14b and c) above. The reason for this is because the causation encoded by the verbs in the instrument unaccusative construction must be expressed in the surface sentence; only unaccusative verbs that permit the inchoative alternation which do not encode causation can have a proto-patient realized as SUBJ *without* a proto-agent realized as OBL₀. The a-structure for inchoative verbs such as ‘open’ or ‘melt’ in sentences such as ‘The door opened’ or ‘The ice melted’ in the current system is depicted in (22).



As can be seen, due to the absence of causation encoded by inchoative verbs, nothing in the conceptual structure (from the causal chain or elsewhere) informs the a-structure of any proto-agents on the 1st or 2nd tier; there is no semantically implied agent for sentences like ‘The door opened’ or ‘The ice melted’. For sentences with inchoative verbs, no instruments realized in a by- or with-phrase or agents realized in a by-phrase are possible, and this is clearly predicted by the a-structure shown in (22). This shows that the sentences, e.g., ‘The door opened’ and ‘The door opened with the key’ encode quite different degrees of causation and this is reflected in their a-

structures in the current system. This also shows that verbs encoding too high a degree of unaccusativity cannot participate in the instrument unaccusative construction, e.g. *‘The man fell with the blow’, *‘The man arrived with the train’. Degrees of causation and inchoatives are discussed further in Subsection 5.4.2.

5.3 Incremental Theme

The conditions we have so far that must be met for the instrument unaccusative construction to be permissible are summarized in (23).

(23) Conditions for the instrument unaccusative construction

1. The instrument must be an intermediary instrument.
2. The verb must be in the *Change of state-transitive counterpart* category of the Unaccusativity Hierarchy.

Condition 2 is met by all the following verbs in (24), and it is possible to construct sample sentences with them that would involve intermediary instruments, so Condition 1 is also met. However, none of them permit the instrument unaccusative construction, and hence there must be (at least) one more condition.

(24)

Verbs of Change of State:

advance, age, alter, burn, char, close, compress, condense, contract, corrode, crumble, decompose, decrease, deflate, defrost, diminish, dissolve, drain, ease, enlarge, expand, fade, fill, flood, fray, freeze, grow, heal, heat, improve, increase, inflate, loop, mature, melt, overturn, scorch, sear, shrink, shrivel, singe, sink, soak, splay, sprout, steep, stretch, submerge, subside, taper, thaw, tire, unfold, vary, warp.

This is a modified list from Levin (1993: 28)

I propose that the additional condition that is required for the instrument unaccusative construction is that the L-OBJECT cannot be an incremental theme; or, in our system, the corresponding proto-patient cannot possess the proto-patient property incremental theme. The term incremental theme refers to arguments that are entailed to undergo a definite change of state “in distinguishable separate stages, i.e. subevents” Dowty

(1991: 568). For example, in each subevent of ‘The ice melted in ten minutes’, the ice undergoes a melting event. Examples of verbs whose subjects possess the incremental theme property and hence do not permit the instrument unaccusative construction are given in (25) with examples in (26).

(25) *melt, emerge, submerge, deflate, bloom, vaporize, decompose.*

Dowty (1991: 571)

- (26) a. The ice melted.
b. *The ice melted with the heater¹⁸.
c. The U-boat submerged.
d. *The U-boat submerged with the controls.

Dowty is correct to point out that although cases such as ‘John drove to New York from Chicago’ can be broken into distinguishable subevents, each subevent does not depict John driving from New York to Chicago (Dowty (1991: 569)). In this example, for Dowty, the incremental theme is the implied path and its part-structure is correlated with the part-structure of the denoted motion event (for further discussion see Filip (1999: 96ff)). Dowty coins the term **holistic theme** to describe such theme arguments. For holistic themes the change of state is “incremental only because of some relationship they bear to the true Incremental theme, not because they undergo a change part by part” Dowty (1991: 569). For our purposes, holistic theme will be assumed to be contained in the proto-patient property *incremental theme*.

The following verbs’ proto-patient objects do not possess *incremental theme* and meet the other two conditions listed in (23) and hence permit the instrument unaccusative construction.

¹⁸ The intended reading here is where ‘heater’ is an instrument, not where ‘with’ has an accompaniment reading as in “both the ice and heater melted”. ‘From the heater’ is grammatical, but ‘from’ is used here to denote a cause and not an instrument. This kind of cause is more akin to natural forces like ‘a storm’ and ‘the wind’ – i.e. an agent is not required/implied as it is for instruments.

(27)

BREAK VERBS: *break, chip, crack, fracture, rip, shatter, smash, snap, splinter, split, tear.*

BEND VERBS: *bend, crease, crinkle, crumple, decrease, fold, rumple, wrinkle.*

OTHER VERBS OF CHANGE OF STATE: *explode, rupture, kindle, light*

Cf. Levin (1993: 28)

The following examples are all grammatical.

- (28) a. The stumps splintered with the cricket ball.
b. The muscle ruptured with the blow.
c. The fire kindled with dry sticks.
d. The fire lit with the petroleum.
e. The jeans ripped with the blade.

The example in (29) might appear to be a counterexample, but the ‘with-phrase’ here marks material use and is not an instrument (see Section 2.2).

(29) The fire burnt with dry sticks.

The example in (30) supports this analysis of (29).

(30) The fire kindled with sticks and then burnt with logs.

Hence the full conditions for the instrument unaccusative construction are:

(31) Conditions for the instrument unaccusative construction

1. The instrument must be an intermediary instrument.
2. The verb must be in the *Change of state-transitive counterpart* category of the Unaccusativity Hierarchy.
3. The L-OBJECT/proto-patient mapped to SUBJ in this construction cannot possess the proto-agent property *incremental theme*.

5.3.1 Limitations of the Incremental Theme Analysis

As we have seen, the *incremental theme* condition accounts for many verbs that do or do not permit the instrument unaccusative construction. Unfortunately, it does not account for all. Consider the following verbs of change of state.

(32) Verbs of Change of State:

awake, capsize, divide, double, halt, hush, ignite, pop, quadruple, triple

This is a modified list from Levin (1993: 28)

These verbs all permit intermediary instruments and the instrument as subject construction (satisfying Condition 1 of (31)):

- (33) a. The bell awoke the baby.
b. The calculator doubled the sum.
c. The pin popped the balloon.

They are in the *change of state-transitive counterpart* category (satisfying Condition 2 of (31)):

- (34) a. The boat capsized.
b. The toddler hushed.

And they do not possess *incremental theme* (satisfying Condition 3 of (31)):

- (35) a. *The number quadrupled halfway.
b. *The candle ignited part way.

Yet they do not permit the instrument unaccusative construction:

- (36) a. *The number tripled with the calculator.
b. *Betty awoke with the alarm clock. (does not mean caused to wake up by the alarm clock)
c. *The car halted with the brake.

Hence these verbs are problematic for the conditions proposed in (31). However, I cannot offer an improvement on the analysis given. It is possible that Condition 3 could be restated in terms of the notion of **affectedness** – Condition 3 would then be ‘the L-OBJECT/proto-patient mapped to SUBJ in this construction must be affected’. The notion of affectedness begins with S. Anderson (1977), but is also used in M. Anderson (1979), Zubizarreta (1987), and Tenny (1992), *inter alia*. An affected

argument is defined as one that is “changed or moved” (M. Anderson (1979: 44)). Closely tied to this notion is the “holistic/partitive” effect. This is shown in the contrast between (37a) and (37b).

- (37) a. Devon smeared butter on the toast.
b. Devon smeared the toast with butter.

Levin & Rappaport Hovav (2005: 209)

In (37a), ‘the toast’ is not totally affected (partitive), whereas in (37b) it is totally affected (holistic). The “holistic/partitive” effect is related to *incremental theme* as those arguments that possess *incremental theme* can usually undergo the effect whereas those that do not cannot undergo the effect.

However, the notion of affectedness has proved very difficult to pin down. M. Anderson’s (1979) definition of “changed or moved” is entirely unsatisfactory. To illustrate with a pair of examples, we can say the state of ‘the window’ is changed in (38) and that the state of ‘the baby’ is changed in (39) but only the former permits the instrument unaccusative construction.

- (38) a. The rock broke the window.
b. The window broke with the rock.

- (39) a. The bell awoke the baby.
b. *The baby awoke with the bell.

Researchers have tried to subsume affectedness under the aspectual notions of telicity and, indeed, *incremental theme* (see Levin & Rappaport Hovav (2005: Sections 4.2.2 and 7.2.3.2)). Regarding telicity, as mentioned in Section 5.2, unaccusative verbs tend to express a telic change of state or location anyway, and so to add this aspect may well be redundant. As the notion of affectedness is elusive and has itself been (partly) defined in terms of the much better understood concept of *incremental theme*, I found

incremental theme to provide a more promising analysis than affectedness; without a more solid definition, affectedness distinguishes grammaticality from ungrammaticality less well as shown by (38) and (39). I think the analysis using *incremental theme* provides a promising start and is along the right lines. However, it should unfortunately be noted that this is not the whole story.

5.4 The Relationship between Ergativity, Causation and Agentivity

There are good reasons to make a distinction between agents and instruments, despite the similarities between them (e.g. agents and instruments are both causal chain participants in the Antecedent area, and both agents and intermediary instruments possess *causal force*), some arguments for which we saw in Subsection 2.3.2. One distinction, claimed by Dowty as we saw in Subsection 4.2.1.1, is that instruments will never have the proto-agent properties *sentience* or *volition*. As the framework endorsed here uses proto-roles, there is not a categorial distinction as such between agents and instruments. Degrees of agentivity expressible through the possession of proto-roles¹⁹. In a sense then, in the surface sentences, agents are ‘more agent-like’ than instruments as they have the potential to possess more proto-agent properties. As *causal force* is a proto-agent property, it should not be surprising if agents carry this property more often than instruments as their degree of agentivity is higher. In this regard, then, it is natural to put intermediary instruments below agents with regards to the level of causation they encode.

Note that clear-cut unergatives often restrict their SUBJECTS as needing to be [+ANIMATE] or [+MENTAL STATE] (see Reinhart (1991: 2)). This relates back to the restriction I noted in Section 4.4 that certain verbs require their SUBJ to be

¹⁹ As mentioned in Subsection 2.3.2, Schlesinger (1989) also argues that the difference between agent and instruments is best encoded through a degree of agentivity rather than a categorial divide.

[+ANIMATE] and therefore prohibit instruments mapped to SUBJ. SUBJECTS that are [+ANIMATE] and/or [+MENTAL STATE] are very likely going to possess the proto-agent properties of *sentience*, *volition*, *causal force* and *movement*. This means that items like intermediary instruments are very often going to be prohibited from being SUBJ of unergative verbs – this fits with our modified claim of Dowty’s that intermediary instruments have the *causal force* plus *movement* proto-role properties but lack the properties *sentience* or *volition*; they are agents minus *sentience* and/or *volition*, if you like. It is also clear that typical proto-patient undergoers (typical SUBJs for unaccusatives) are not going to be mappable to SUBJ for such verbs as clear-cut unergatives as they will lack the relevant proto-agent properties. It follows from these facts that clear-cut unergatives will be excluded from the verbs that allow the instrument unaccusative construction. Therefore, a verb which does allow the instrument unaccusative construction must at least be a little way up the Unaccusativity Hierarchy as depicted in (15) – the bottom two classes are certainly excluded.

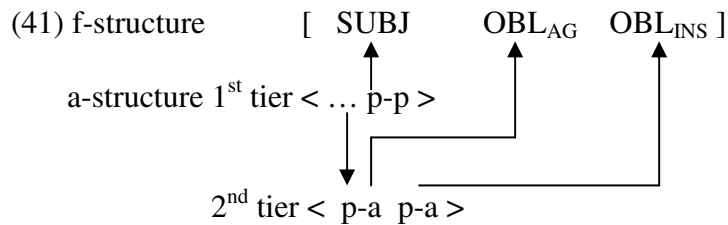
5.4.1 Passives

A central point I want to make arises in comparison of the passive construction and the instrument unaccusative construction. We saw in Section 3.7 how the current apparatus deals with the passive construction. Here I shall comment more on passives.

Consider the following alternations.

- (40) a. Jack opened the door with the key.
b. The door was opened.
c. The door was opened by Jack.
d. %The door was opened by the key.
e. The door was opened with the key.
f. *The door was opened with Jack.
g. *The door was opened by Jack by the key.

(40a) is an active sentence with an instrument; (40b) is a corresponding passive with the agent and instrument omitted; (40c) is a corresponding passive with the agent present: the fact that the agent realized as an OBL by-phrase is optional (cf 40b) shows that it is a 2nd tier proto-agent in our terms. The unacceptability of two by-phrases as evidenced by (40g) is evidence that the by-phrase is not an adjunct. This shows that the 1st tier proto-agent of the a-structure for passives is *demoted* to the 2nd tier and not deleted as it is in the instrument unaccusative construction. (40d) is not accepted by all speakers where the instrument is realized in a by-phrase²⁰; (40e) is much preferred where the instrument is realized in a with-phrase. Again, the fact that the instrument is optional shows it remains on the 2nd tier in the passive construction. (40f) shows that the agent cannot be realized in a with-phrase. Hence the mapping algorithm for the passive construction is (41). We see the 1st tier proto-agent demoted, the 1st tier proto-patient mapped to SUBJ, and the 2nd tier proto-agents mapped to OBLIQUEs.



5.4.2 The Causation Hierarchy

It has been noted that the passive construction implies an agent whereas inchoatives do not (e.g. Schäfer (2008)). There are some standard tests that detect implied agents: *licensing of agentive adverbs*, *control into purpose clauses* and *licensing of by-phrases* (Schäfer (2008: 2)). In (42a), it is implied that somebody or something

²⁰ Personally, I accept (40d). A Google search for “The door was opened by the key” returns only 5 hits, all of them from linguistic writings with 2 of the 5 occurrences asterisked.

opened the door, and the tests in (42b-d) show this, whereas in (43a) the door may have opened under its own weight without an external cause and the tests in (43b-d) show the ungrammaticality of including an implied agent.

(42) Passives

- a. The door was opened.
- b. The door was opened on purpose. (*licensing of agentive adverbs*)
- c. The door was opened [PRO to air the room]. (*control into purpose clauses*)
- d. The door was opened by Jack. (*licensing of by-phrases*)

(43) Inchoatives

- a. The door opened.
- b. *The door opened on purpose. (*licensing of agentive adverbs*)
- c. *The door opened [PRO to air the room]. (*control into purpose clauses*)
- d. *The door opened by Jack (*licensing of by-phrases*)

From this we can say that inchoatives or clear-cut unaccusatives like (43a) do not encode as high a degree of causation as passives like (42a) do. Instrument unaccusative constructions sit somewhere in between passives and inchoatives/clear-cut unaccusatives in the degree of causation they can encode. Similar to the Unaccusativity Hierarchy, then, I propose a Causative Hierarchy, on which different constructions encode different degrees of causation.

(44) The Causation Hierarchy

Construction	Example
<i>Active</i>	Jack opened the door (with the key).
<i>Instrument as Subject</i>	The key opened the door.
<i>Passive</i>	The door was opened (by Jack).
<i>Instrument Unaccusative</i>	The door opened with the key.
<i>Inchoative</i>	The door opened.

The expressions at the top of the hierarchy encode a higher degree of causation. Note the active construction with the highest degree of causation is obligatorily transitive: both the agent and the theme are obligatory. This is reflected in the causation expressed, that the causer (agent) and object undergoing the change of state (theme)

must be expressed. In addition, the proto-agent in active causative verbs must possess *causal force*. The passive and instrument as subject constructions express a similar degree of causation. In the passive construction, the agent may be optionally expressed whereas it cannot in the instrument as subject construction; it is a 2nd tier argument in the passive construction and a 1st tier one in the instrument as subject construction. The 1st tier proto-agent of the instrument as subject construction must, as we saw in Subsection 4.2.1.1, possess *causal force*. Although in passives the demoted proto-agent will possess *causal force* and a proto-agent 2nd tier instrument, if present, may also possess *causal force*, both being 2nd tier arguments, neither are obligatory and so the nature of passive constructions is such that they do not need to express their encoded causation. It is for this reason, which follows closely the representation at a-structure, that I have ranked the instrument as subject construction as higher than the passive construction.

From the Causation Hierarchy, we see more motivation for the proposed analysis of the instrument unaccusative construction. The top two constructions express the causer/L-SUBJECT/proto-agent as SUBJ and the L-OBJECT as OBJ; the bottom three constructions all have the undergoer/L-OBJECT/proto-patient as SUBJ: this is one pattern, and shows the lower degree of causation expressed in the instrument unaccusative construction. It is clear that inchoatives encode the lowest degree of causation as no proto-agent possessing *causal force* is possible (see (22) in Section 5.2), whether syntactically realized or semantically implied. The a-structure of instrument unaccusative constructions has an instrument 1st tier proto-agent which will possess *causal force* – it is an intermediary instrument. The a-structure of passive constructions has an agent 2nd tier proto-agent which will possess *causal force* and possibly, if present in the causal chain, an instrument 2nd tier proto-agent that may or

may not possess *causal force*. Although the instrument unaccusative construction must *express* the proto-agent with *causal force* in the surface sentence form, the passive construction always *encodes* a proto-agent with *causal force* in its a-structure on the 2nd tier. Thus there is always a semantically implied proto-agent possessing *causal force* in passive constructions. That it is an agent in the passive with the possibility of possessing more proto-agent properties and hence expressing a higher degree of agentivity and an instrument in the instrument unaccusative construction with a lower degree of agentivity is one reason to rank the passive construction higher in the Causation Hierarchy. A second reason for this ranking is that the passive construction can also encode an additional 2nd tier proto-agent possessing *causal force* in the form of an instrument; but the instrument unaccusative construction cannot encode an additional proto-agent in the form of an agent:

- (45) a. *The door opened by Jack.
b. *The door opened by the key.
c. *The door opened by Jack with the key.

If a speaker wants to encode this degree of causation, the speaker must use a construction than permits a higher encoding of causation (it follows from this that the inchoative construction would also be inappropriate for this purpose). The fact that the instrument unaccusative construction must express its proto-agent is a syntactic requirement of the construction due to the fact, as we saw, that the verbs that can appear in it do not uniformly encode a high enough degree of unaccusativity to not realize an argument/a-adjunct encoding causation. But in terms of a-structure, as I have shown, it is clear the passive construction encodes more causation than the instrument unaccusative construction.

What I have shown in this section is motivation for why the instrument unaccusative construction encodes the degree of causation it does. I showed that unergative verbs express a too strong degree of agentivity and causation, and that pure unaccusative verbs do not express enough. Hence the elements (including the verb) that permit the instrument unaccusative construction lie between these two extremes.

5.5 The Case of *open*

Many of the examples we have seen have used the verb *open*. I draw attention to it here because, at first glance, it is problematic for the current analysis because ‘the door’ possesses the proto-patient property *incremental theme* as shown by (46).

- (46) a. Jack opened the door halfway.
b. Jack slowly opened the door further and further.

The potential problem is that if this is an incremental theme the instrument unaccusative construction should not be permitted, but it is as shown by (1) of this chapter repeated here as (47).

- (47) The door opened with the key.

However, *open* has a number of meanings²¹ some of which can be alternatively employed for the same sentence. The meaning *open* has in (47) is that of ‘unlock’, and *unlock* does not permit its proto-patient OBJ to possess *incremental theme*. This is shown by (48).

- (48) a. Jack unlocked the door with the key.
b. The key unlocked the door.
c. ?Jack unlocked the door halfway.
d. ?/*The key unlocked the door halfway.
e. The door unlocked with the key.

²¹ <http://dictionary.reference.com/> consulted for definitions 29/03/08.

(48a and b) correspond to the meaning of *open* in (47) and the other related alternations we have seen. (48c and d) show that ‘the door’ with the verb *unlock* cannot possess *incremental theme* – the result state of ‘the door’ cannot be “half-(un)locked”. Note that the instrument unaccusative construction in (48e) is good. The meaning of *open* in (46) however is ‘move’. Under this interpretation, (49b) is a little odd because it means “Jack moved the door halfway open using the key”, that is, he used the key to *push* the door open. Note here that ‘the key’ is a facilitating instrument. (49c) is ungrammatical because, as a facilitating instrument, ‘the key’ cannot be realized as SUBJ (in the instrument as subject construction); the intended meaning of (49c) is the key causally moved the door to a halfway open position.

- (49) a. Jack opened the door halfway. (where ‘open’ means ‘move’).
b. ?Jack opened the door halfway with the key.
c. *The key opened the door halfway.

Two other common meanings of *open* whose objects don’t possess *incremental theme* nevertheless do not permit the instrument as subject or the instrument unaccusative constructions because, in the cases of (50) and (51), the instruments are facilitating.

- (50) *Open* meaning ‘expand; unfold’.
a. The General opened the map with the ruler.
b. *The ruler opened the map.
c. *The map opened with the ruler.

- (51) *Open* meaning ‘begin’.
a. The auctioneer opened the proceedings with the gavel.
b. *The gavel opened the proceedings.
c. *The proceedings opened with the gavel.

5.6 A Comparison of the Instrument Unaccusative Construction and the Middle Construction

English middle constructions (or middles) involve a proto-patient as subject and usually an adverb modifying the verb.

- (52) a. Greek translates easily.
b. The baggage transfers efficiently.
c. Messages transmit rapidly by satellite.
d. The letters transpose easily.
e. The boxes will not transport easily.

Keyser & Roeper (1984: 383)

The verbs here are transitive and do not have obvious inchoative forms, as shown in

(53).

- (53) a. *Greek translates.
b. *The baggage transfers.

Middles have a form that communicates the concept that *such-and-such* [the SUBJECT] *undergoes* [the VERB] *in such way* [the ADVERB]. Keyser & Roeper (1984) point out that middles are generic statements and therefore do not describe particular events in time – they do not permit an eventive reading.

- (54) a. ?Yesterday, the mayor bribed easily, according to the newspaper.
b. ?At yesterday's house party, the kitchen wall painted easily.

Keyser & Roeper (1984: 384)

The ungrammatical sentences in (54) are meant to contrast with the acceptable generics in (55).

- (55) a. Mayors bribe easily.
b. Kitchen walls paint easily.

Although this conclusion is at least generally accepted in the literature (see, e.g., Fagan (1985), Schäfer (2008)), and although I do not find (54) acceptable either, it seems some degree of eventivity is expressible in middles: Keyser and Roeper's own examples (52b, d and e) seem to me to permit an eventive reading. These eventive readings, when possible, are favourable if they express a contrastive reading. Nevertheless, a generic reading is more readily available and permitted more often than an eventive reading for possible combinations of NPs, verbs and adverbs.

Interesting to the current study is the claim made by Schäfer (2008) that middles can be regarded as **generic unaccusatives**. Middles clearly are at the unaccusative end of the Unaccusativity Hierarchy as their subjects undergo a change denoted by the verb. The adverb – which differs from usual occurrences of adverbs in that, when it appears, it is obligatory – expresses how the subject undergoes the change denoted by the verb in general (hence generic).

The instrument unaccusative constructions we have seen so far have all been eventive, but they can occur with a generic reading too.

- (56) a. Doors open with keys.
b. Paper sticks with glue.
c. Cord cuts with scissors.
d. Windows break with rocks.

These are not middles themselves as (57) shows instruments can themselves occur with middle constructions.

- (57) a. Doors open easily with keys.
b. Paper sticks quickly with glue.
c. Cord cuts neatly with scissors.
d. Windows break easily with rocks.

Schäfer applies the standard tests for agentivity we saw in Section 5.4.2 to middles and suggests they show that a semantically implied agent does not seem to be totally missing when the right conditions are met. Schäfer comments that an implied agent for him means an agent is semantically but not syntactically active (in our terms this means the agent is in the causal chain but not in the a-structure).

- (58) a. *Such texts translate (easily) deliberately/passionately.
b. *Such texts translate easily [PRO to win the Translator's Prize].
c. *Such texts translate easily by an experienced translator.
- (59) a. This cup breaks easily (*all by itself).
b. This cup broke suddenly all by itself.
- (60) a. This glass breaks easily with a hammer.
b. The window broke suddenly (*with a hammer).

Schäfer (2008: 2)

The ungrammatical cases in (58) pattern like inchoatives in showing incompatibility with an (implied) agent. Note however that (58c) is acceptable if the agent is introduced with 'for' instead of 'by'²². (59a) is a middle and the ungrammaticality of the 'all by itself' phrase shows there is an implied agent. This contrasts with the eventive unaccusative in (59b) where the 'all by itself' phrase is possible showing the lack of an implied agent. (60a), a middle with an instrument, is fine, whereas the eventive unaccusative in (60b) with an instrument is not, the idea being that the instrument here implies an agent (an agent is necessary conceptually to utilize the instrument). However, it is not so much the eventive interpretation of (60b) as the agentive adverb that results in the realization of the instrument phrase in this case being ungrammatical. If we replace 'suddenly' with 'easily' the result is fine:

- (61) The window broke easily with a hammer.

²² This was pointed out to me by Mary Dalrymple (pc).

If we apply the standard tests for (implied) agentivity to the instrument unaccusative construction we see a very similar result to that of middles: there is some implied agentivity, but it is in no way as high as that for passives.

- (62) a. *This glass breaks with a hammer on purpose.
 b. *The glass broke with a hammer on purpose.
 c. *Glass breaks with hammers on purpose.
- (63) a. *This glass breaks with a hammer all by itself.
 b. *The glass broke with a hammer all by itself.
 c. *Glass sometimes breaks with hammers all by itself.
- (64) a. This glass breaks with a hammer [PRO to allow exit from the building].
 b. The glass broke with a hammer [PRO to allow exit from the building].
 c. ?Glass breaks with hammers [PRO to allow exits from buildings].
- (65) a. *This glass breaks with a hammer by Harry.
 b. *The glass broke with a hammer by Harry.
 c. *Glass breaks with hammers by Harry.

The tests and results here show further support for the Causation Hierarchy (that constructions encode different degrees of causation) and the place instrument unaccusatives take on it. The results also show that middles occupy a similar place to instrument unaccusatives on the Causation Hierarchy.

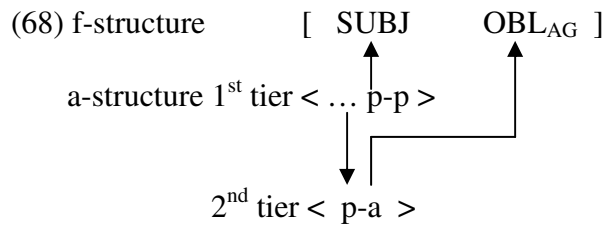
5.7 Linguistic Constructions with the Two Tier A-structure System II

We saw in Section 3.7 and Subsection 5.4.1 the mapping algorithm for passive constructions, repeated here as (66)-(68).

- (66) a. The door was opened by Jack.
 b. The door was opened.

(67)

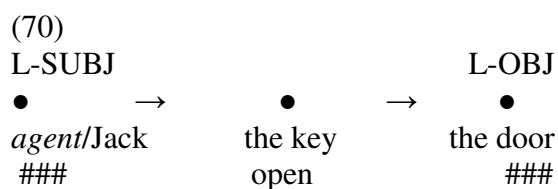
L-SUBJ		L-OBJ
●	→	●
Jack		the door
###	open	###



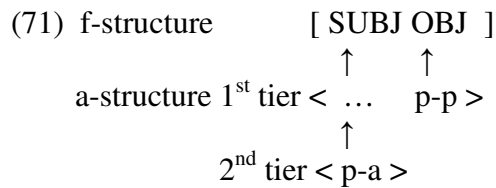
As noted by Nilsen (1973: 150), both agents mapped to SUBJ ((66)) and instruments mapped to SUBJ can be passivized.

- (69) a. The key opened the door.
 b. The door was opened by the key.

The causal chain for (69a) and (69b) is the same and is shown in (70).



The L-SUBJ is '*agent*/Jack' as it is possible that the speaker does not know who the agent is in uttering (69a or b). It might be that the speaker does not know who opened the door with the key, but, for example, sees the key lying on the floor near the open door and so can utter (69a) or (69b). The idea is that there is a semantically implied agent for (69a) and (69b) represented in the causal chain, which follows the line of reasoning given in Section 3.5 that instruments are sequentially second in the causal chain. The difference between (69a) and (69b) comes from the a-structure and the mapping to f-structure. We saw the mapping for (69a) as (48) of Chapter 4, repeated here as (71).

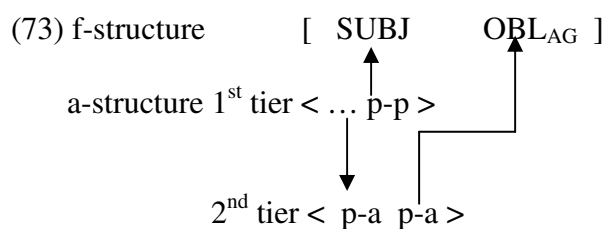


In (71)'s a-structure and mapping algorithm, the causal chain provides a 1st tier proto-agent which is then deleted, and the 2nd tier proto-agent moves up to the 1st tier from where it is mapped to SUBJ. The mapping for (69b) is a little different. Firstly, whereas the agent has been deleted in the a-structure of (69a) and cannot be realized as an OBL (see (72a)), it is optional for (69b) as shown by (72b) (hence we want it on the 2nd tier).

- (72) a. *The key opened the door by Jack.
 b. The door was opened by Jack with the key.

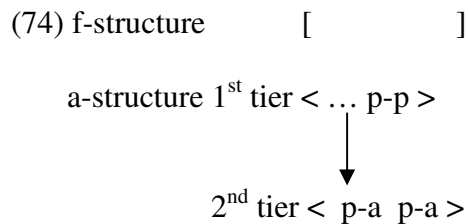
Note that when the agent is realized as an OBL as it is in (72b), the instrument must be realized with 'with'. This shows that we cannot have two agents or two instruments in the construction, and so is another piece of evidence that agents and instruments are distinguishable in some way (though not a piece of evidence that they are categorically distinct). This is reflected in LFG's f-structure by showing we can have OBL_{AG} and OBL_{INS}, but not OBL_{AG} and OBL_{AG}, or OBL_{INS} and OBL_{INS}.

The semantically implied agent will also be syntactically implied (i.e. on the 2nd tier of the a-structure) for (69b) but not for (69a). The mapping algorithm for (69b) is this:

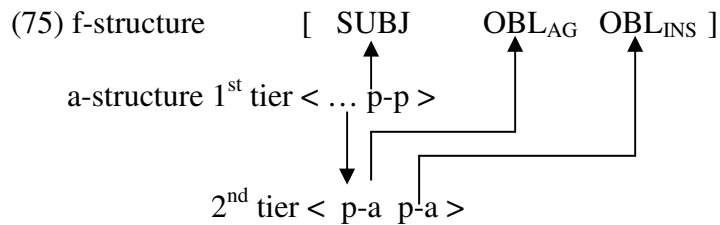


The 1st tier proto-agent is demoted to the 2nd tier where it can be realized as an OBL (although it is not in (69b)). The second 2nd tier proto-agent is the instrument, mapped here to OBL_{AG}.

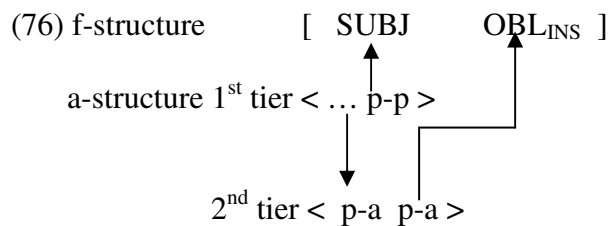
The mapping algorithm for (72b) is different to that of (69b), although the *a-structures* are the same as shown in (74).



The f-structure in (74) is empty as mapping has not yet been done. From the a-structure of (74), the proto-patient and proto-agents can be mapped to generate either (69b) or (72b). If (72b) is generated, the mapping algorithm is this:



Of course (40e) ‘The door was opened with the key’ is also fine, and the mapping algorithm for that is (76) (again, the *a-structure* for (40e) is (74), the same for (69b) and (72b)).



Hence instruments can take ‘by’ or ‘with’ (a point also noted by Nilsen (1973: 65), although Lyons (1968: 298) claims instruments cannot be marked with ‘by’). Agents cannot be marked with ‘with’, only ‘by’.

5.8 Summary

I have argued that the instrument unaccusative construction requires three conditions to be grammatical.

(77) Conditions for the instrument unaccusative construction

1. The instrument must be an intermediary instrument.
2. The verb must be in the *change of state-transitive counterpart* category of the Unaccusativity Hierarchy.
3. The L-OBJECT proto-patient mapped to SUBJ in this construction cannot possess *incremental theme*.

The following examples show that each of these conditions is necessary to account for the (un)grammaticality of instrument unaccusative constructions.

(78) *The tank exploded with the well-crafted plan.

1. Intermediary Instrument	CONDITION NOT MET
2. Change of state-transitive counterpart category	CONDITION MET
3. Incremental theme	CONDITION MET

(79) *The man died with the bullet.

1. Intermediary Instrument	CONDITION MET
2. Change of state-transitive counterpart category	CONDITION NOT MET
3. Incremental theme	CONDITION MET

(80) *The ice melted with the heater.

1. Intermediary Instrument	CONDITION MET
2. Change of state-transitive counterpart category	CONDITION MET
3. Incremental theme	CONDITION NOT MET

When these conditions are met, the mapping rules for the instrument unaccusative construction are as follows. The 1st tier proto-agent is deleted. To enable the correct, grammatical surface structure, the 2nd tier proto-agent moves to a position on the 1st tier after the proto-patient and is mapped to OBL_{INS}. As we saw, this ordering on the

6 Conclusion

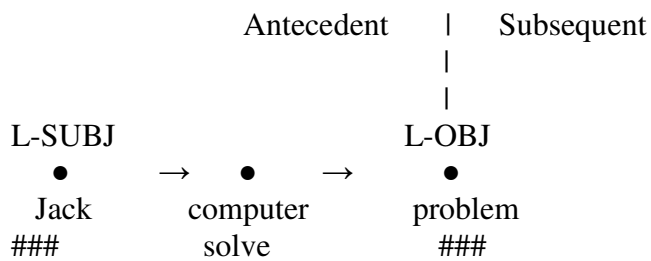
6.1 Introduction

In this chapter, I collect the main results from the previous chapters and present them here. In the final section, I comment on what I think would be some suitable avenues for continuing this line of research.

6.2 Instruments in Causal Chains

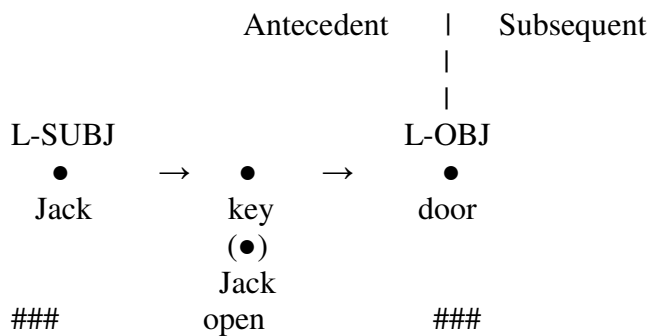
Intermediary instrument with onset causation

(1) Jack solved the problem with the computer.



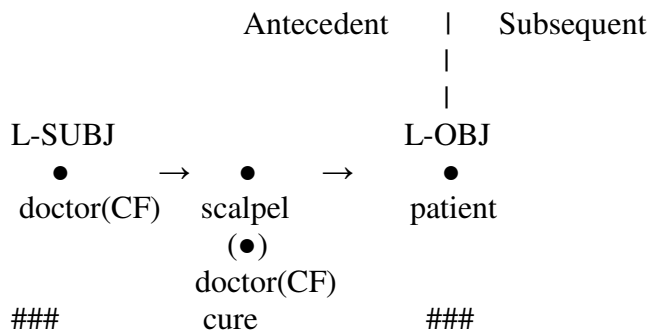
Intermediary instrument with extended causation

(2) Jack opened the door with the key.



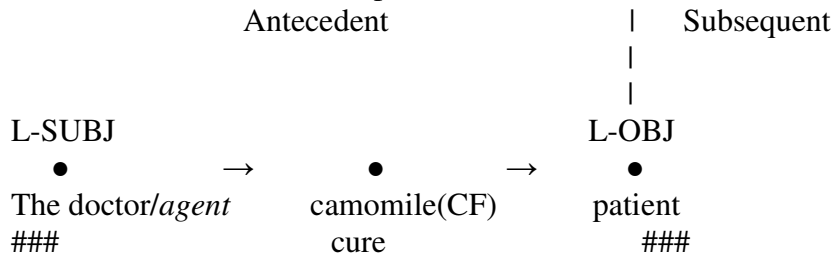
Facilitating instrument with extended causation

(3) The doctor cured the patient with the scalpel.



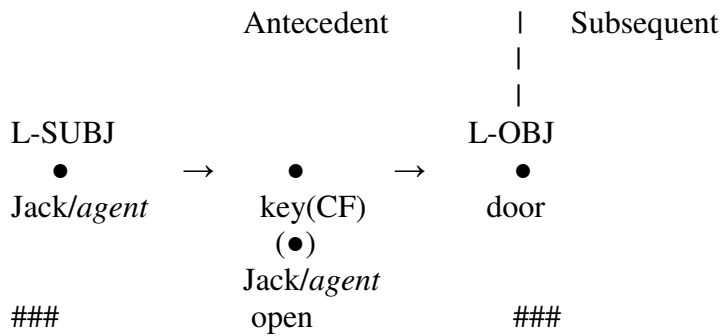
Instrument as subject construction with onset causation

(4) The camomile cured the patient.



Instrument as subject construction with extended causation

(5) The key opened the door.



6.3 Mapping Algorithms

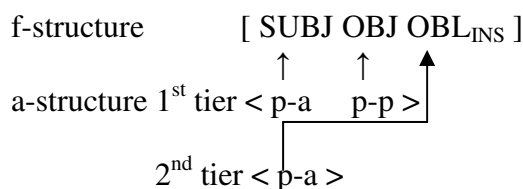
The mapping from a-structure to f-structure rules I have argued for in this paper that capture the data considered are given again here. 2nd tier arguments are always optional.

(6) Mapping Rules for the standard instrument construction

1st tier proto-agent > SUBJECT
 1st tier proto-patient > OBJECT
 2nd tier proto-agent > OBLIQUE_{INS}

Example: Jack opened the door (with the key).

Diagram:

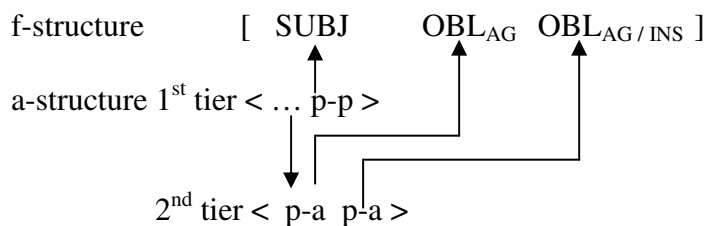


(7) Mapping Rules for the passive construction

1st tier proto-agent > 2nd tier > OBLIQUE_{AG}
 1st tier proto-patient > SUBJECT
 2nd tier proto-agent > OBLIQUE_{INS}

Example: The door was opened (by Jack) (with the key).

Diagram:



If the instrument is mapped to OBLIQUE_{AG} as in ‘The door was opened by the key’, the agent cannot be mapped to OBLIQUE_{AG} because two agents are not permitted in the f-structure or surface construction and, as agents cannot be realized with ‘with’,

the agent cannot be mapped to OBLIQUE_{INS} either (*'The door was opened by the key with Jack').

(8) Mapping Rules for the instrument as subject construction

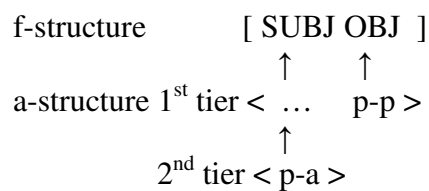
[1st tier proto-agent deleted]

1st tier proto-patient > OBJECT

2nd tier proto-agent > 1st tier > SUBJECT

Example: The key opened the door.

Diagram:



(9) Mapping Rules for the instrument unaccusative construction

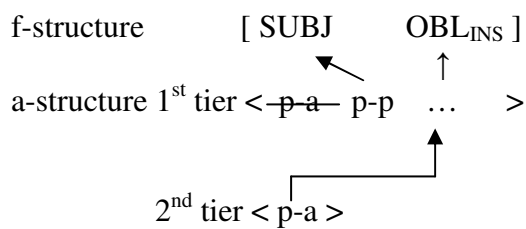
[1st tier proto-agent deleted]

1st tier proto-patient > SUBJECT

2nd tier proto-agent > 1st tier > OBLIQUE_{INS}

Example: The door opened with the key.

Diagram:



6.4 Conditions

These are the conditions that I have argued affect the permissibility of the instrument as subject construction:

(10) Conditions affecting the instrument as subject construction in the causal chain

(1) Onset causation (instrument will always possess <i>causal force</i>)	IaSC✓
(2) Extended causation	(a) Instrument possesses <i>causal force</i> IaSC✓
	(b) Instrument does not possess <i>causal force</i> IaSC✗

Key

IaSC = Instrument as Subject Construction

✓ = IaSC possible

✗ = IaSC not possible

Outside of the causal chain, I proposed a third condition, the Animacy Condition, which states that certain VPs demand their SUBJ to be [+ANIMATE], and, if the SUBJ is [-ANIMATE], then, no matter whether the other conditions are satisfied or not, the instrument as subject construction will be ungrammatical.

These are the conditions that I have argued affect the permissibility of the instrument unaccusative construction:

(11) Conditions for the instrument unaccusative construction

1. The instrument must be an intermediary instrument.
2. The verb must be in the *Change of state-transitive counterpart* category of the Unaccusativity Hierarchy.
3. The L-OBJECT proto-patient mapped to SUBJ in this construction cannot possess *incremental theme*.

6.5 Further Research

This research, with the exception of a very brief look at Japanese, has been undertaken entirely on English. One obvious and important extension is to consider the analysis presented here for instruments cross-linguistically. In addition, animacy and the Animacy Condition needs to be considered cross-linguistically for the present

analysis to be widely applicable. For example, do verbs such as 'eat' in all languages place the Animacy Condition on their SUBJs?.

In my opinion, the major shortcoming of the current proposal is the absence of a complete analysis of the instrument unaccusative construction. Therefore, future research should continue the investigation of this construction across as wide a range of verbs as possible. It is hoped that the current proposal has provided the beginnings of an analysis that will be beneficial to such research.

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