Latex for Linguistics Notes*

Gina Author2

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Contents

*Acknowledgments: tons and tons of other latex for linguists websites and tutorials

Abstract

This is an abstract of what this paper is about. This collection of latex source started in 2003 from reading a LaTEX for Everyone by Jane Hahn (published in 1993). Since then a number of commands had changed in LaTeX 2ε. This document contains the latest commands (to my knowledge) as of Feb 2008.

Alternatively, you can make an abstract like this (see source). blah

Part I
Instalation

1 How to use LaTeX

You can use Latex on Windows, MacOS and Linux.

LaTeX is a type of programming language for formating scientific texts/books. It's not a Word Processor (like Microsoft Word, WordPad or WordPerfect). In fact, all word processers save their documents in a code that is readable by that application. LaTex is like this code, its a level deeper than what you view, and allows you more control over the document than a Word Processor.

LaTex makes it very easy to draw uniform diagrams and write forumlas using plain text. If you already know a bit about HTML or any other programming language this will be easy for you.

There are 3 steps to making a file in LaTeX.

- Edit a plain text file.
- run LaTex to proccess the file.
- view the output (there are three formats for the output, dvi, ps, pdf. there are differences that will be discussed later).

After you are finished your document it will exist as a .pdf

LaTex began on the Linux operating system. So the installation for Linux users is very common and there are plenty of explainations online. Similarly Mac OS X is actually based off of Linux, so its also common to install Latex on a Mac. Since running Latex on Microsoft Windows is the most complicated, I will explain a way to install LaTeX on a MS Windows machine. (If you have a Mac you can try http://www.esm.psu.edu/mac-tex/)

1.1 Windows instalation

Getting LaTeXto run on windows can be annoying. As of March 2008 here is something that works:

- Download MikTex (the distribution of LaTeX for windows, for linux its teTeX, for Mac its XeTeX or something like that),
  - download and open a file similar to setup-2.7.2904.exe This file is both for downloading, and for installing.
  - First choose the Download MiKTex, then choose Basic (it takes less time to download) or choose Complete (this is better if you can do it, because you will have less problems installing packages later)
  - Choose a source to download from (the sources in the united states are not reliable and quit downloading in the middle, the sources from canada and austria work pretty well. if the source stops downloading in the middle you can just repeat the same process and it will skip the files that it has already sucessfully downloaded and continue to download where it left off.)
- Install MikTex using the same file as before: setup-2.7.2904.exe
- Install an IDE (Integrated Development Environment) a centralized place to edit your LaTex source, and view the output(s) in DVI, PS or PDF format. There are two options I know about: TeXnicCenter (a file named something like TXCSetup_1Beta7_01.exe) and TexMaker, but I've had far more errors and trouble using TexMaker, so I like TeXnicCenter better.
- Install Ghostscript and Ghostview (do an internet search for them and how to install them)
- Open a .tex file using the IDE (TeXnixCenter), browse around and try to latex it
- Install packages that you need (often if you need a package a box will pop up when you latex the file which will ask you to download the file. This might work. But, a surefire way to install packages is to go to $Start >> Programs >> MiKTeX >> BrowsePackages$)
- If you have packages that you want to use, but they aren't downloadable (ie, you made them or someone else made them) then you can go $Start >> Programs >> MiKTeX >> Settings$ again you should browse around and become familiar with the options. Choose the Roots tab, this is a list of directories where the packages (.sty files) can be saved. Basically you can put your .sty files into C:
  Local TeX Files , then go the General tab in the Settings box, and click on Refresh FNDB (this refreshes the database of packages, and it should find your new packages)
- Try editing your .tex document, and viewing it. You might have to explore around the IDE (TeXnicCenter) to find out how to do a spell check, how to latex the document, how to view the document, and how to change your output between DVI, PS and PDF.

(Note, this advice is old, from 2003 and might not be true anymore.) There are basically 4 stages to get from a .tex file to the .pdf that you can distribute.

- Latex the file into a DVI (Device Independant Format)
  now the output is viewable with Yap
- dvips the file from dvi to ps (Post Script, a langauge that printers can read, the predecesor of pdf)
  now the output is viewable with Ghost View
- distill/print the document from ps to pdf (Portable Document Format)
  now the output is viewable with Adobe Reader/Professional

These extra stages have been recently bypassed using pdfTex. This makes a better pdf using modern pdf features. But, linguists use a number of packages that use ps specials (specials are arrows and lines) that can only be displayed in ps, which are then converted into images when the document is made as a pdf.

So, for most linguistics papers we are forced to go through the 4 stages of output. If you ever have arrows and graphics that dont show up, (or error messages like "Non-PDF special ignored!") chances are youre using pdfTex, and you need to change some options in your IDE to get it to go through all the dvi and ps stages.

Part II
Using LaTex

2 Here is a Section

In this section (Section 2) we will first see how to make sections (in 2), subsections (in 2.1) and subsubsections (in 2.1.1). In §2.2 we will see some more advanced tools for sectioning.

2.1 This is a subsection

'Twas brillig, and the slithy toves Did gyre and gimble in the wabe: All mimsy were the borogoves, And the mome raths outgrabe.

"Beware the Jabberwock, my son! The jaws that bite, the claws that catch! Beware the Jubjub bird, and shun The frumious Bandersnatch!"

2.1.1 This is a subsubsection

He took his vorpal sword in hand: Long time the manxome foe he sought– So rested he by the Tumtum tree, And stood awhile in thought.

And, as in uffish thought he stood, The Jabberwock, with eyes of flame, Came whiffling through the tulgey wood, And burbled as it came!

One, two! One, two! And through and through The vorpal blade went snicker-snack! He left it dead, and with its head He went galumphing back.

2.1.2 Paragraphs and subparagraphs

This is just about the headings use of pharagrahs. The spacing of pharagraphs is discussed in §4.

This is a paragraph "And hast thou slain the Jabberwock? Come to my arms, my beamish boy! O frabjous day! Callooh! Callay!" He chortled in his joy.

This is a subparagraph 'Twas brillig, and the slithy toves Did gyre and gimble in the wabe: All mimsy were the borogoves, And the mome raths outgrabe.

2.2 Advanced Sectioning: Section headings are automatically displayed in the table of contents

You must always tex a document twice in order to get a correct table of contents, and to get the references to be correctly evaluated.

The table of contents will be displayed where you use the command `\tableofcontents`.

Although sections are automatically put in the Table of Contents (TOC), there are three things you can do to change this.

- You can use section headings as just headings (that dont appear in the TOC and dont have a number) with `\section*{JustAHeading}`
- You can specify an optional arugment for the section's TOC entry (to modify/shorten a section heading) with `\section[ShortVersion]{FullVersion}`
- You can add a non-numbered line[1] in the TOC (to indicate a new Part) with `\addcontentsline{toc}{section}{PartII:}`

[1] The addcontentsline must appear on the same page as the unnumberd heading inorder to have the right page number in the table of contents.

But this subsection will have no number and serves as a heading

To make a simple heading you can add an asterix in the code between the command and its argument (see code).

2.2.1 Long: Occams greatest Razor and Shaving Cream

This section's TOC entry is different from its heading in the text. The TOC entry is specified in an [optional argument] (see code).

3 Cross Referenecs

References `\ref{}` (not to be confused with a bibliography) will take the number of the example or section that their corresponding `\label{}` command is located after (look for some examples in the code). You can also do `\pageref{}` For example, spacing is discussed on page 5.

Counters can be reset (counters: part, chapter, section, subsection, subsubsection, paragraph, page, equation, figure, table, footnote, enumi, enumii). See the source between the table of contents and document body, and between the body and the appendix.

You can create your own counter with newcounter, do an internet search for more info.

It helps to name your labels with a prefix depending on what they are, ie a section as sec: or example as ex: (see code for examples).

4 How Spacing Works in LaTeX

4.1 Basic Spacing: spaces, paragraphs, tabs

LaTeXignores spacing in your source code, it handles all the spacing for you. Ignoring the spacing in code is actually useful, it means you can space your code so that it is easy to read.

(1) Summary of Spacing, and ways to force it

- Any number of blank lines will make a new paragraph (use `\\` force a paragraph)
- Indentation is handled automatically (use `\noindent` to force no indentation)
- Any number of spaces will make 1 space (use `~` to force a space)
- Tabs are completely ignored. (use `~~~~~~or\hspace{.3in}` to force a tab)

The tilda is also useful for things like § 1, Section 1, Generalization 1, Figure 1, Example 1 where you dont want the 'Example' and the '1' to be seperated by a line break (see code).
You can get a single line break
like this
and this.

4.2 Indentation: Using quote and quotation

The formated output (3) was created with forced spacing. The unformated output (2) is what it looks like with no forced spacing:

(2) Here is what an unformated 'Le Jabberwock' looks like:
Il était grilheure; les slictueux toves Gyraient sur l'alloinde et vriblaient: Tout flivoreux allaient les borogoves; Les verchons fourgus bourniflaient.

"Prends garde au Jabberwock, mon fils! A sa gueule qui mord, à ses griffes qui happent! Gare l'oiseau Jubjube, et laisse En paix le frumieux Bandersnatch!"

Le jeune homme, ayant pris sa vorpaline épée, Cherchait longtemps l'ennemi manziquais... Puis, arrivé prs de l'Arbre Tépé, Pour réfléchir un instant s'arrêtait.

Or, comme il ruminait de suffêches penses, Le Jabberwock, l'oeil flamboyant, Ruginiflant par le bois touffeté, Arrivait en barigoulant.

Une, deux! Une, deux! D'outre en outre! Le glaive vorpalin virevolte, flac-vlan! Il terrasse le monstre, et, brandissant sa tête, Il s'en retourne galomphant.

"Tu as donc tué le Jabberwock! Dans mes bras, mon fils rayonnois! O jour frabieux! Callouh! Callock!" Le vieux glouffait de joie.

Il était grilheure; les slictueux toves Gyraient sur l'alloinde et vriblaient: Tout flivoreux allaient les borogoves; Les verchons fourgus bourniflaient.

(3) Here is what 'Le Jabberwock' should look like.

'Le Jabberwock'
Translated by Henri Parisot:
http://www.keithlim.com/jabberwocky/translations/index.html

Il était grilheure; les slictueux toves
Gyraient sur l'alloinde et vriblaient:
Tout flivoreux allaient les borogoves;
Les verchons fourgus bourniflaient.

"Prends garde au Jabberwock, mon fils!
A sa gueule qui mord, à ses griffes qui happent!
Gare l'oiseau Jubjube, et laisse
En paix le frumieux Bandersnatch!"

Le jeune homme, ayant pris sa vorpaline épée,
Cherchait longtemps l'ennemi manziquais...
Puis, arrivé prs de l'Arbre Tépé,
Pour réfléchir un instant s'arrêtait.

Or, comme il ruminait de suffêches penses,
Le Jabberwock, l'oeil flamboyant,
Ruginiflant par le bois touffeté,
Arrivait en barigoulant.

Une, deux! Une, deux! D'outre en outre!
Le glaive vorpalin virevolte, flac-vlan!
Il terrasse le monstre, et, brandissant sa tête,
Il s'en retourne galomphant.

"Tu as donc tué le Jabberwock!
Dans mes bras, mon fils rayonnois!
O jour frabieux! Callouh! Callock!"
Le vieux glouffait de joie.

Il était grilheure; les slictueux toves
Gyraient sur l'alloinde et vriblaient:
Tout flivoreux allaient les borogoves;
Les verchons fourgus bourniflaient.

The formated output (3) was created using quote. If you want to make a paragraph quotation you can use quotation

> Unfortunately, within linguistics it has not been generally recognized how important such formal, theoretical work is; instead there is a feeling that too much concern for theoretical detail is a waste of time... [T]he attitude that formal, theoretical work is bound to be both ad-hoc and sterile is, I am convinced, fundamentally mistaken ...
>
> Morris Halle (1975:530)

4.3 Advanced Spacing: vspace and hspace

You can create vertical space

like this. You can create horizontal space like this. This can be useful in graphics, figures and examples. hspace can be useful in getting Trees to be smaller... but vspace and hspace are hacks that are best avoided and can have bad consequences.

5 Lists and Enumeration

5.1 Enumerated Lists

There are only four levels of list available. You can have an itemize list inside of an enumerated list and vice versa. See Item 1a, Item 1(a)i, Item 1(a)iA for examples of using references in lists.

Here is the automated way enumerated lists look

1. This is the first level
   (a) This is the second level
      i. This is the third level
         A. This is the fourth level
   (b) This is the seecond item in the second level
2. This is the second item in the first level

5.2 Itemized Lists

Here is the way that a normal itemized list looks. You change the bullet symbols to anything you want.

- here is a bunch of embedded items
- buy groceries
  - potatoes
    - red
      - russet
    - yellow
  - celery
  - frying chicken
  - milk

o Here is a changed example pay bills

♡ Here is a changed example do laundry

(a) Here is a changed example using a literal (a)

OK Here is a changed example using the word 'OK'

5.3 Descriptive Lists

Descriptive lists are good for glossaries, and can also be used as a quick solution for references/bibliography.

Dogs Dogs, with their friendly obedient nature, make excellent pets. There are many differnt sizes of dogs, ranging from a bundle you can old in one hand to a 50–60 pound animal tha tbegins to resemle a horse.

Cat etc Cats are ideal pets for people who are on-the-go. Independent and intellegent in nature, they do not require a great deal of attention. While being well able to entertain and take care of themselves, ats also offer warmth and affection to their owners.

Birds Birds add a splash of colour and a pleasant background music to the household. The patient bird owner can train his pet to talk and sit on his finger, and even ride around town on his shoulder.

Boersma, Paul & David Weenink 2003, *Praat: Doing Phonetics by Computer.* Version 4.0.43, http://www.praat.org.

Keating, Patricia A. 1988, "Underspecification in phonetics," *Phonology 5.2*, pp. 275-292.

Ohala, John J. Draft 2001,"Aerodynamic Principles" (Chapter 2), " Acoustics", (Chapter 3) *Phonology in Your Ear*, pp. 3-56.

Ohala, John J.& Manjari Ohala 1995, "Speech perception and lexical representation of vowel nasalization in Hindi and English", *Phonology and Phonetic Evidence Papers in Laboratory Phonology IV*, Cambridge University Press, pp. 41-60.

6 Examples

6.1 Formating glossed examples

(4) *kʰəndala* **ke**$_2$ *gʱət* **ke**$_3$ *upə̰r* *foto* *kʰĩʧ* **ke**$_4$ *ajẽ ge*
Khandala=gen.pl? Ghat=obl above photo take=ke come.pl=fut
'Up on the Khandala Ghat we'll take a photo.'
(*Ghulam,* lyrics from 'Aati kya Khandala?' 1998)

6.2 Formating using math mode

Equation numbers are usually on the right, but they can be put on the left using [leqno] in the documentclass command (see the preamble in the source)

$$x = y + z \tag{5}$$

That was Equation 5. (Number provided by the ref command.) And another paragraph may follow the equation. To produce the same equation without a number, type the following:

$$x = y + z$$

$$\int_0^\infty f(x) = g(x) \tag{6}$$

$$\sum_1^5 x = 15$$

Using the shorthand notation, LaTeXwill still create

$$x = y + z$$

the equation in the middle of the page even though the source has the equatin in the middle of a block of text..

You can access math mode in the text using `\math{x=y+z}` or the short cut: dollar signs $ around the text that should be formated in math mode. $x = y + z$ $x = y + z$ this is useful for subscripts he$_i$ or T$_{past}$ and superscripts v^o or v^{intrans}. LaTeX Can have the sums and integrals taller or shorter depending on use of hte displaystyle of textstyle. Here is an in-line integral: $\int_0^1 f(x) = g(x)$, and here is an in-line summation: $\sum_1^5 x = 15$. They look different from the displayed forms.

Here is a bunch of text to make a paragraph to see how the tall integral will look. Here is a *tall* in-line integral: $\int_0^1 f(x) = g(x)$. And here is a *short* displayed summation (See, they're not pretty when used in the opposite contexts. fortunatly latex will take care of that.)

$$\sum_1^5 x = 15$$

$$x = i_{jk} \tag{7}$$

7 Languages and quick ways to make accents and diacritics

ò Ó ô Ö õ Ō ȯ Ǒ ŏ Ő t͡s Ǫ ǫ Ǭ œŒæÆåÅøØłŁßˀ ¡ ©£¶75 §†‡

¿Como está ustead?
Notre amour est chose légére.
Ein Vögelein fliegt über den Rhein.

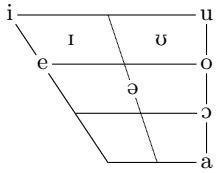
8 Examples

8.1 Phonology

(8) Surface Inventory for Consonants

Stops	p,b	t,d	ɖ		k,g	ʔ
Fricatives		s				h
Affricates				č,ĵ		
Nasals	m	n	ɳ	ñ	ŋ	
Liquids		l	r			
Glides				j	w	

(9) Surface Inventory for Vowels



(10) What is the relationship between [a] and [ɔ] ?

Full Specification Approach

Change : +low → -low, -round → +round

$$[\text{a}]: \begin{bmatrix} +syl \\ +voiced \\ -high \\ +back \\ -ATR \\ +low \\ -round \end{bmatrix} \quad [\text{ɔ}]: \begin{bmatrix} +syl \\ +voiced \\ -high \\ +back \\ -ATR \\ -low \\ +round \end{bmatrix}$$

Contrastive Specification Approach

Change : +low → -low

Fill : Øhigh → -high, Øback → +back, ØATR → -ATR, Øround → +round

$$[\text{a}]: \begin{bmatrix} +syl \\ +low \end{bmatrix} \quad [\text{ɔ}]: \begin{bmatrix} +syl \\ -high \\ +back \\ -ATR \\ -low \\ +round \end{bmatrix}$$

(11) H Deletion

			*[$_\sigma$h	Max IO	Onset	No Coda
		/butuh/				
MostFaith	☞	bu.tʊh				*
LeastMark	MaxIO ≫NoCoda	bu.tu		*		
		/butuh/+/e/				
	☞	bu.tu.e		*	*	
MostFaith,LeastMark	*[$_\sigma$h ≫MaxIO,Onset	bu.tu.he	*			

(12) Halle-Sagey Style Representation of Shared Features of *singular* /u/

$[-cons]$

[+son]

Laryngeal *Place* $[+contin]$

$[voiced]$ *Dorsal* *Labial*

$[high]$ $[back]$ $[round]$

(13) Place Agreement
Place of articulation spreads from left to right (indicated by (2)).

$[+cons]$ $[+cons]$

^{1} ^{2} ^{1}

place *place*

(14) Feature Specifications (Halle, Vaux, Wolf 2000)

(15) Romanian Surface Consonant Inventory

		Secondary Specifications											
		[-cont] [-strid]		[-cont] [+strid]		[+cont] [+strid]		[+nas]	[+lat]	[+rotic]			
Primary Articul	[labial]	p	b			f	v	m					
	[cor, +ant]	t	d	ts	dz	s	z	n	l		r		
	[cor, -ant]			tʃ	dʒ	ʃ	ʒ						
	[dorsal]	k	g			x		ŋ					
	[glottal]	h											

(16) Anterior Assimilation Rule: Velars

(k) (j)

X X

$Place$ $Place$

$Body$ $Blade$

$[dorsal]$ $[+anterior]$

Dashed - - : added link

(17) $næk^{w}æs^{j}$ floating Labial [round] and final TH [high] associate

X $Oral$ (n)

X

X $Oral$ $(k)Dorsal$ TT $[back]$

X Labial –[round]

X $Oral-(s)$ $Dorsal$ TH –[high]

TT $[front]$

$Coronal$ $TongueGrove$ $[grooved]$

$[fricative]$

(18) $g^{w}əz^{j}$ /gz/ 'cut . . . ', Labial [round] & TH [high] 'feminine', reduplicated

#

X $Oral$ $(g)Dorsal$ TT $[back]$

X Labial –[round]

X $Oral$ $(z)Dorsal$ TT $[front]$

% TH –[high]

(19) Obstruent+Stop clusters

$$\left[\ -son\ \right]\left[\begin{array}{l}-son\\-cont\\ \alpha voice\end{array}\right]\rightarrow\left[\begin{array}{l}-son\\ \alpha voice\end{array}\right]\left[\begin{array}{l}-son\\-cont\\ \alpha voice\end{array}\right]$$

(20) Obstruent+Fricative clusters

$$\left[\ -son\ \right]\left[\begin{array}{l}-son\\+cont\end{array}\right]\rightarrow\left[\begin{array}{l}-son\\-voice\end{array}\right]\left[\begin{array}{l}-son\\+cont\\-voice\end{array}\right]$$

(21) Derivation, association, cyclic speading inwards

L H H

k i l i f o k a f o

L H H
k i l i f o k a f o
L H H
k i l i f o k a f o

(22)

	tanepwtina	*Clash	WSP	Ft Bin	Right most	NonFin Stress	Parse Syl	All FtR	Non Fin
☞	ta(nèpwa)(tína)						*	**	*
	(tanèp)wa(tína)						*	***!	*
	ta(nèpwa)(tiná)					*!	*	**	*
	ta(népwa)(tìna)				*!		*	**	*
	(tanèp)(watí)na				*!		*	****	
	(ta)(nèpwa)(tína)			*!				******	*
	(tànep)wa(tína)		*!				*	**	*

(23) 1. Project vowels

L *H* *L* *L* *L*

t a n e p w a t i n a

2. Insert L bracket to the L of H

L (*H* *L* *L* *L*

t a n e p w a t i n a

3. Iterate: Insert L bracket to the L of pairs

L (*H* *L* (*L* *L*

t a n e p w a t i n a

4. Head: Left, project head

X *X*

L (*H* *L* (*L* *L*

t a n e p w a t i n a

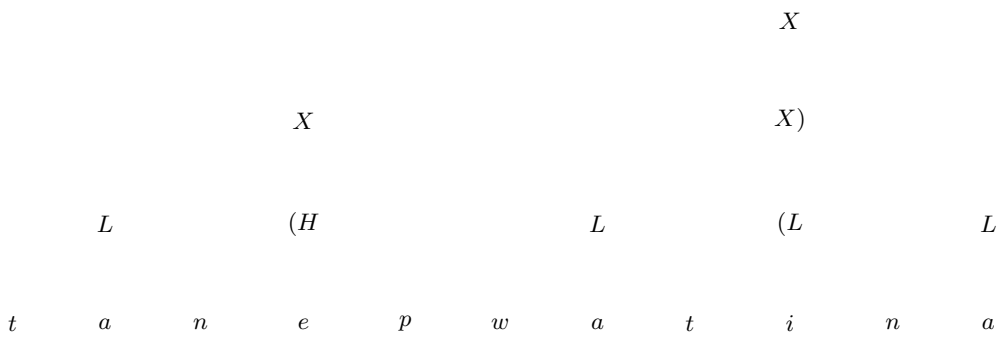
5. Edge: R bracket to the R of the R most element

X *X*)

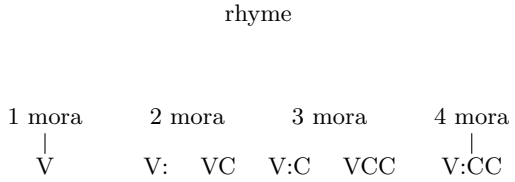
L (*H* *L* (*L* *L*

t a n e p w a t i n a

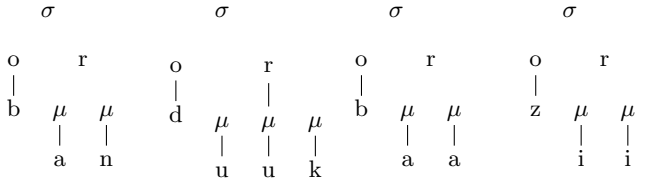
6. Head: Right, project head



(24) Hindi Rhyme configurations (Shukla, 2000)



(25) $\mu.\mu\mu\mu.\mu\mu.\mu\mu$: ban'du:kba:zi: 'marksmanship'



(26)

Input: /kat+z/	* [−son, αvoice]	[−son, −αvoice]	IDENT-IO(voice)	* [−son, +voice]
☞ [kats]			*	
[kadz]			*	*! *
[gats]			* *!	
[katz]	*!			
[kads]	*!			

(27) A factorial typology of reduplication systems - Kager Ch5,Ex5
Five factorial (!5) is 5*4*3*2*1 = 120 different rankings

1	Align-Red-L	≫Max-BR	≫No-Coda	≫Onset	≫Red-σ
2	Align-Red-L	≫Max-BR	≫No-Coda	≫Red-σ	≫Onset
3	Align-Red-L	≫Max-BR	≫Onset	≫No-Coda	≫Red-σ
4	Align-Red-L	≫Max-BR	≫Onset	≫Red-σ	≫No-Coda
5	Align-Red-L	≫Max-BR	≫Red-σ	≫Onset	≫No-Coda
6	Align-Red-L	≫Max-BR	≫Red-σ	≫No-Coda	≫Onset
7	Align-Red-L	≫No-Coda	≫Max-BR	≫Onset	≫Red-σ
8	Align-Red-L	≫No-Coda	≫Max-BR	≫Red-σ	≫Onset
9	Align-Red-L	≫No-Coda	≫Onset	≫Max-BR	≫Red-σ
10	Align-Red-L	≫No-Coda	≫Onset	≫Red-σ	≫Max-BR
11	Align-Red-L	≫No-Coda	≫Red-σ	≫Onset	≫Max-BR
12	Align-Red-L	≫No-Coda	≫Red-σ	≫Max-BR	≫Onset
13	Align-Red-L	≫Onset	≫No-Coda	≫Max-BR	≫Red-σ

14	Align-Red-L	≫Onset	≫No-Coda	≫Red-σ	≫Max-BR
15	Align-Red-L	≫Onset	≫Max-BR	≫No-Coda	≫Red-σ
16	Align-Red-L	≫Onset	≫Max-BR	≫Red-σ	≫No-Coda
17	Align-Red-L	≫Onset	≫Red-σ	≫Max-BR	≫No-Coda
18	Align-Red-L	≫Onset	≫Red-σ	≫No-Coda	≫Max-BR
19	Align-Red-L	≫Red-σ	≫No-Coda	≫Onset	≫Max-BR
20	Align-Red-L	≫Red-σ	≫No-Coda	≫Max-BR	≫Onset
21	Align-Red-L	≫Red-σ	≫Onset	≫No-Coda	≫Max-BR
22	Align-Red-L	≫Red-σ	≫Onset	≫Max-BR	≫No-Coda
23	Align-Red-L	≫Red-σ	≫Max-BR	≫Onset	≫No-Coda
24	Align-Red-L	≫Red-σ	≫Max-BR	≫No-Coda	≫Onset
25	Max-BR	≫Align-Red-L	≫No-Coda	≫Onset	≫Red-σ
26	Max-BR	≫Align-Red-L	≫No-Coda	≫Red-σ	≫Onset
27	Max-BR	≫Align-Red-L	≫Onset	≫No-Coda	≫Red-σ
28	Max-BR	≫Align-Red-L	≫Onset	≫Red-σ	≫No-Coda
29	Max-BR	≫Align-Red-L	≫Red-σ	≫Onset	≫No-Coda
30	Max-BR	≫Align-Red-L	≫Red-σ	≫No-Coda	≫Onset
31	Max-BR	≫No-Coda	≫Align-Red-L	≫Onset	≫Red-σ
32	Max-BR	≫No-Coda	≫Align-Red-L	≫Red-σ	≫Onset
33	Max-BR	≫No-Coda	≫Onset	≫Align-Red-L	≫Red-σ
34	Max-BR	≫No-Coda	≫Onset	≫Red-σ	≫Align-Red-L
35	Max-BR	≫No-Coda	≫Red-σ	≫Onset	≫Align-Red-L
36	Max-BR	≫No-Coda	≫Red-σ	≫Align-Red-L	≫Onset
37	Max-BR	≫Onset	≫No-Coda	≫Align-Red-L	≫Red-σ
38	Max-BR	≫Onset	≫No-Coda	≫Red-σ	≫Align-Red-L
39	Max-BR	≫Onset	≫Align-Red-L	≫No-Coda	≫Red-σ
40	Max-BR	≫Onset	≫Align-Red-L	≫Red-σ	≫No-Coda
41	Max-BR	≫Onset	≫Red-σ	≫Align-Red-L	≫No-Coda
42	Max-BR	≫Onset	≫Red-σ	≫No-Coda	≫Align-Red-L
43	Max-BR	≫Red-σ	≫No-Coda	≫Onset	≫Align-Red-L
44	Max-BR	≫Red-σ	≫No-Coda	≫Align-Red-L	≫Onset
45	Max-BR	≫Red-σ	≫Onset	≫No-Coda	≫Align-Red-L
46	Max-BR	≫Red-σ	≫Onset	≫Align-Red-L	≫No-Coda
47	Max-BR	≫Red-σ	≫Align-Red-L	≫Onset	≫No-Coda
48	Max-BR	≫Red-σ	≫Align-Red-L	≫No-Coda	≫Onset
49	No-Coda	≫Max-BR	≫Align-Red-L	≫Onset	≫Red-σ
50	No-Coda	≫Max-BR	≫Align-Red-L	≫Red-σ	≫Onset
51	No-Coda	≫Max-BR	≫Onset	≫Align-Red-L	≫Red-σ
52	No-Coda	≫Max-BR	≫Onset	≫Red-σ	≫Align-Red-L
53	No-Coda	≫Max-BR	≫Red-σ	≫Onset	≫Align-Red-L
54	No-Coda	≫Max-BR	≫Red-σ	≫Align-Red-L	≫Onset
55	No-Coda	≫Align-Red-L	≫Max-BR	≫Onset	≫Red-σ
56	No-Coda	≫Align-Red-L	≫Max-BR	≫Red-σ	≫Onset
57	No-Coda	≫Align-Red-L	≫Onset	≫Max-BR	≫Red-σ
58	No-Coda	≫Align-Red-L	≫Onset	≫Red-σ	≫Max-BR
59	No-Coda	≫Align-Red-L	≫Red-σ	≫Onset	≫Max-BR
60	No-Coda	≫Align-Red-L	≫Red-σ	≫Max-BR	≫Onset
61	No-Coda	≫Onset	≫Align-Red-L	≫Max-BR	≫Red-σ
62	No-Coda	≫Onset	≫Align-Red-L	≫Red-σ	≫Max-BR
63	No-Coda	≫Onset	≫Max-BR	≫Align-Red-L	≫Red-σ
64	No-Coda	≫Onset	≫Max-BR	≫Red-σ	≫Align-Red-L
65	No-Coda	≫Onset	≫Red-σ	≫Max-BR	≫Align-Red-L

66	No-Coda	≫Onset	≫Red-σ	≫Align-Red-L	≫Max-BR
67	No-Coda	≫Red-σ	≫Align-Red-L	≫Onset	≫Max-BR
68	No-Coda	≫Red-σ	≫Align-Red-L	≫Max-BR	≫Onset
69	No-Coda	≫Red-σ	≫Onset	≫Align-Red-L	≫Max-BR
70	No-Coda	≫Red-σ	≫Onset	≫Max-BR	≫Align-Red-L
71	No-Coda	≫Red-σ	≫Max-BR	≫Onset	≫Align-Red-L
72	No-Coda	≫Red-σ	≫Max-BR	≫Align-Red-L	≫Onset
73	Onset	≫Max-BR	≫No-Coda	≫Align-Red-L	≫Red-σ
74	Onset	≫Max-BR	≫No-Coda	≫Red-σ	≫Align-Red-L
75	Onset	≫Max-BR	≫Align-Red-L	≫No-Coda	≫Red-σ
76	Onset	≫Max-BR	≫Align-Red-L	≫Red-σ	≫No-Coda
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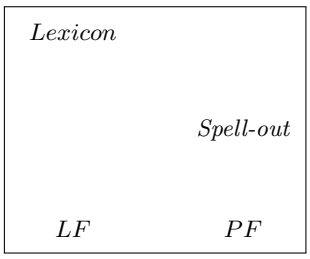
81	Onset	≫No-Coda	≫Align-Red-L	≫Max-BR	≫Red-σ
82	Onset	≫No-Coda	≫Align-Red-L	≫Red-σ	≫Max-BR
83	Onset	≫No-Coda	≫Red-σ	≫Align-Red-L	≫Max-BR
84	Onset	≫No-Coda	≫Red-σ	≫Max-BR	≫Align-Red-L
85	Onset	≫Align-Red-L	≫No-Coda	≫Max-BR	≫Red-σ
86	Onset	≫Align-Red-L	≫No-Coda	≫Red-σ	≫Max-BR
87	Onset	≫Align-Red-L	≫Max-BR	≫No-Coda	≫Red-σ
88	Onset	≫Align-Red-L	≫Max-BR	≫Red-σ	≫No-Coda
89	Onset	≫Align-Red-L	≫Red-σ	≫Max-BR	≫No-Coda
90	Onset	≫Align-Red-L	≫Red-σ	≫No-Coda	≫Max-BR
91	Onset	≫Red-σ	≫No-Coda	≫Align-Red-L	≫Max-BR
92	Onset	≫Red-σ	≫No-Coda	≫Max-BR	≫Align-Red-L
93	Onset	≫Red-σ	≫Align-Red-L	≫No-Coda	≫Max-BR
94	Onset	≫Red-σ	≫Align-Red-L	≫Max-BR	≫No-Coda
95	Onset	≫Red-σ	≫Max-BR	≫Align-Red-L	≫No-Coda
96	Onset	≫Red-σ	≫Max-BR	≫No-Coda	≫Align-Red-L
97	Red-σ	≫Max-BR	≫No-Coda	≫Onset	≫Align-Red-L
98	Red-σ	≫Max-BR	≫No-Coda	≫Align-Red-L	≫Onset
99	Red-σ	≫Max-BR	≫Onset	≫No-Coda	≫Align-Red-L
100	Red-σ	≫Max-BR	≫Onset	≫Align-Red-L	≫No-Coda
101	Red-σ	≫Max-BR	≫Align-Red-L	≫Onset	≫No-Coda
102	Red-σ	≫Max-BR	≫Align-Red-L	≫No-Coda	≫Onset
103	Red-σ	≫No-Coda	≫Max-BR	≫Onset	≫Align-Red-L
104	Red-σ	≫No-Coda	≫Max-BR	≫Align-Red-L	≫Onset
105	Red-σ	≫No-Coda	≫Onset	≫Max-BR	≫Align-Red-L
106	Red-σ	≫No-Coda	≫Onset	≫Align-Red-L	≫Max-BR
107	Red-σ	≫No-Coda	≫Align-Red-L	≫Onset	≫Max-BR
108	Red-σ	≫No-Coda	≫Align-Red-L	≫Max-BR	≫Onset
109	Red-σ	≫Onset	≫No-Coda	≫Max-BR	≫Align-Red-L
110	Red-σ	≫Onset	≫No-Coda	≫Align-Red-L	≫Max-BR
111	Red-σ	≫Onset	≫Max-BR	≫No-Coda	≫Align-Red-L
112	Red-σ	≫Onset	≫Max-BR	≫Align-Red-L	≫No-Coda
113	Red-σ	≫Onset	≫Align-Red-L	≫Max-BR	≫No-Coda
114	Red-σ	≫Onset	≫Align-Red-L	≫No-Coda	≫Max-BR
115	Red-σ	≫Align-Red-L	≫No-Coda	≫Onset	≫Max-BR
116	Red-σ	≫Align-Red-L	≫No-Coda	≫Max-BR	≫Onset
117	Red-σ	≫Align-Red-L	≫Onset	≫No-Coda	≫Max-BR

118	Red-σ	≫Align-Red-L	≫Onset	≫Max-BR	≫No-Coda
119	Red-σ	≫Align-Red-L	≫Max-BR	≫Onset	≫No-Coda
120	Red-σ	≫Align-Red-L	≫Max-BR	≫No-Coda	≫Onset

8.2 Morphology

(28)



(29) Arrernte Frequentive Forms
$verb + ep + finalsyllable + em$

verb
root
unt
v°
ø
atelic
ep
freq
unt
prog
em

(30) Derivation of Frequentive Forms

1. Verb # e m p^{w} a r %
2. Suffix ep # e m p^{w} a r %
   e
   p
3. Final segment precedes Final syllable
   # e m p^{w} a r %
   p e
4. Suffix em
   e m
   # e m p^{w} a r %
   p e

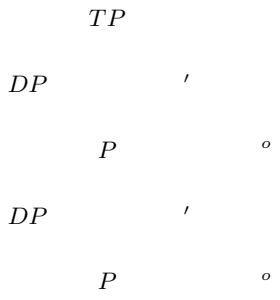
(31) Final syllable precedes stressed syllable
X $\sigma_{A+stress}$ Y σ_{Bn} %

(Where X and Y represent a sequence of 0+ atoms.)

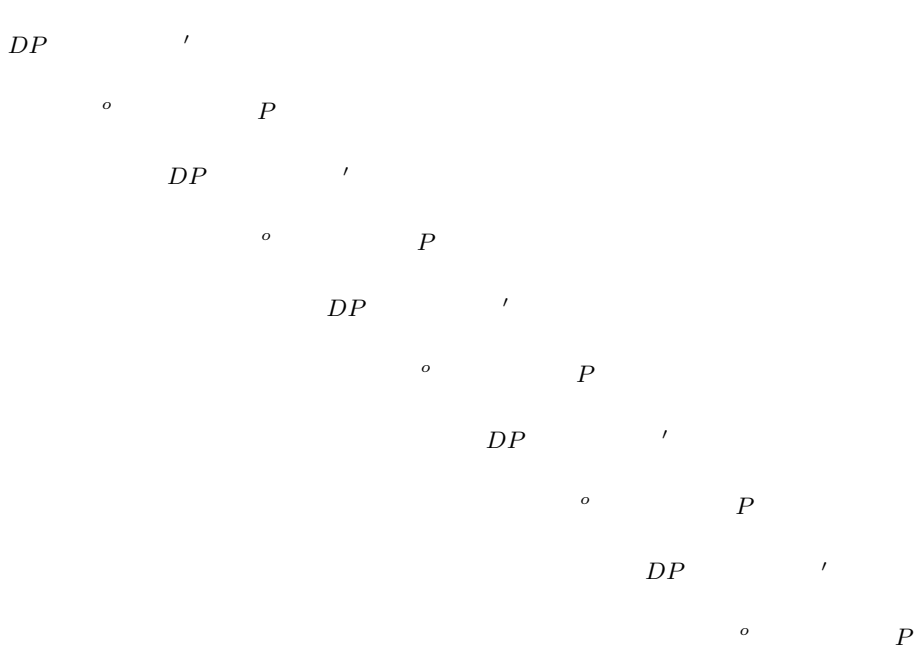
8.3 Syntax

8.3.1 Tree templates for copying

(32) Head Final Structure for copying

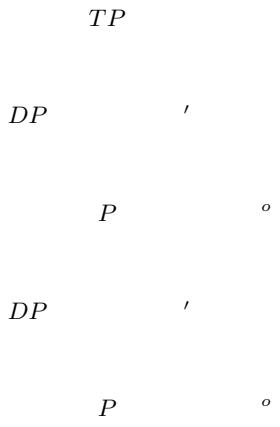


(33) Head Initial Structure for copying



8.3.2 Changing spacing in the tree

(34) Default space



You can use Treek to change the vertical spacing, put its argument in curly braces

```
\Treek{3}
```

(35) 3 space

TP

DP $'$

P ^{o}

DP $'$

P ^{o}

You can also change the horizontal spacing with an optional argument in square brackets in either Tree (the default vertical spacing) or Treek (a specified vertical spacing)

`\Treek[4]{3} or \Tree[4]`

(36) 3 space, with 4 wide

TP

DP $'$

P ^{o}

DP $'$

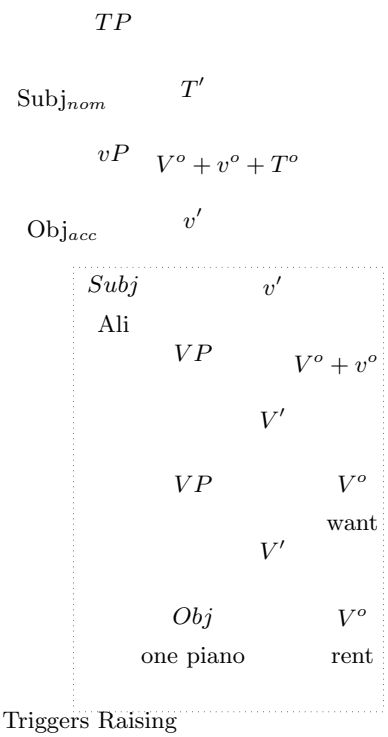
P ^{o}

8.3.3 Complicated tree samples

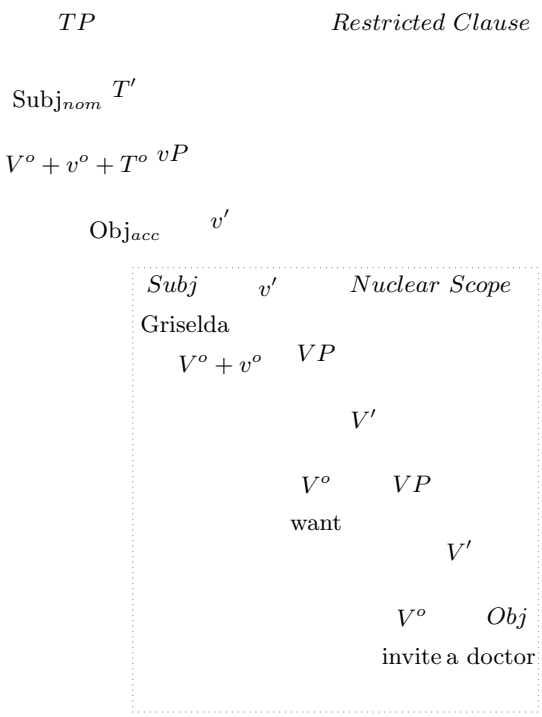
These examples were made from looking at the xyling documentation.

(37) Raising for Case

a) Turkish

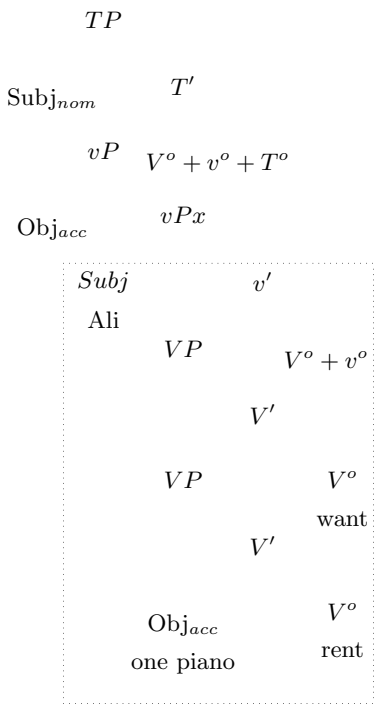


b) Spanish

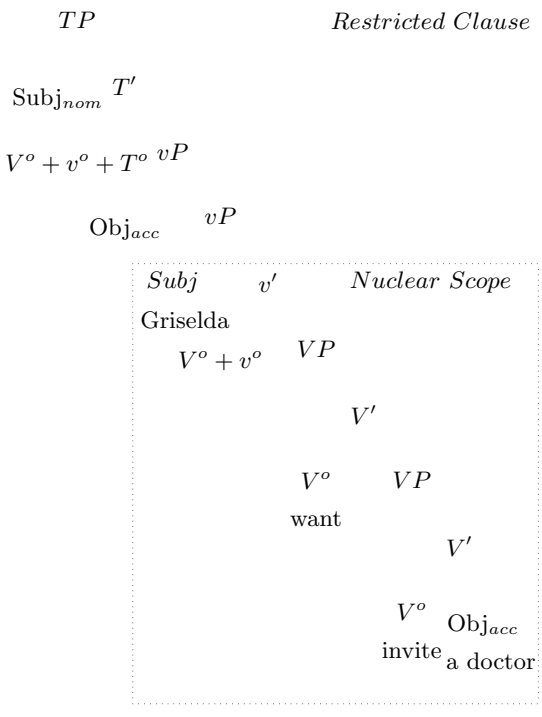


(38) Case Triggers Raising

a) Turkish



b) Spanish



8.4 Semantics

(39) Sample denotation brackets

$$\left[\!\left[\begin{array}{cc} & \\ \text{Ann} & \text{walks} \end{array} \right]\!\right] = (\llbracket \textbf{Ann} \rrbracket)\llbracket \textbf{walks} \rrbracket$$

(40) Semantic Combination under Functional Application (FA)

$$\llbracket\gamma\rrbracket = \llbracket\alpha\rrbracket(\llbracket\beta\rrbracket)$$

FA

$\llbracket\alpha\rrbracket$ $\llbracket\beta\rrbracket$

(41) Typical example of Functional Appilcation (FA)

(a) English

$VP_{<e,t>} = \llbracket\mathbf{hug}\rrbracket(\llbracket\mathbf{NP}\rrbracket)$

FA

$V_{<e,<e,t>>}$ NP_e

$\llbracket\mathbf{hug}\rrbracket$ $\llbracket\mathbf{Mary}\rrbracket$

(b) Turkish

$VP_{<e,t>} = (\llbracket\mathbf{NP-e}\rrbracket)\llbracket\mathbf{sardil-di}\rrbracket$

FA

NP_e $V_{<e,<e,t>>}$

$\llbracket\mathbf{Mary\text{-}e}\rrbracket$ $\llbracket\mathbf{sarid\text{-}di}\rrbracket$

(42) Semantic Combination under Intersection (a.k.a. Predicate Modification)

$$\llbracket\gamma\rrbracket = \llbracket\alpha\rrbracket \cap \llbracket\beta\rrbracket$$

$\cap$

$\llbracket\alpha\rrbracket$ $\llbracket\beta\rrbracket$

(43) Typical example of Intersection/Predicate Modification($\cap$/PM)

$$NP_{<e,t>} = \llbracket\mathbf{Adj}\rrbracket \cap \llbracket\mathbf{NP}\rrbracket$$

$\cap$

$AdjP_{<e,t>}$ $NP_{<e,t>}$

$\llbracket\mathbf{blue}\rrbracket$ $\llbracket\mathbf{ball}\rrbracket$

(44) The Intersection Generalization: Adjectives

(i) English Example:

Assumption: γ is an Individual

If γ is a wuggy ball (where wuggy stands for any adjective), then

it is necessarily the case that γ is wuggy and,

it is necessarily the case that γ is a ball.

(ii) This can be modelled logically as:

Assumption: $\gamma \in D_{individuals}$

$\gamma \in (\llbracket\mathbf{Adjective}\rrbracket \cap \llbracket\mathbf{Noun}\rrbracket)$

$\models \gamma \in \llbracket\mathbf{Adjective}\rrbracket$

$\models \gamma \in \llbracket\mathbf{Noun}\rrbracket$

(iii) In words: If γ is a member of the intersection of sets $\llbracket\mathbf{Adjective}\rrbracket$ and $\llbracket\mathbf{Noun}\rrbracket$, then

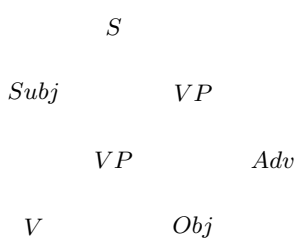
it is necessarily the case that γ is a member of $\llbracket\mathbf{Adjective}\rrbracket$ and

it is necessarily the case thatγ is a member of $\llbracket\mathbf{Noun}\rrbracket$.

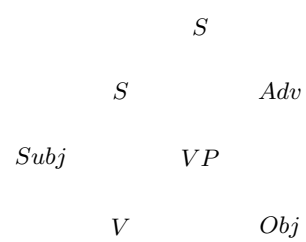
(iv) $\llbracket\mathbf{Adj}\rrbracket \cap \llbracket\mathbf{Noun}\rrbracket$

(45) Adverbs have two possible places of attachment

(a) Attached to VP



(b) Attached to S



(46) Tense is easy to add via Intersection

$TP_{\{e\}}$ = {e: John is an agent of e ∩ e is a running event ∩ e happened in the past}

∩

$T_{\{e\}}$ Past

$VP_{\{e\}}$ = {e: John is an agent of e ∩ e is a running event}

NP **⟦John⟧** VP **⟦ran⟧**

(47) Extra-Linguistic Solution: A sentence is true if the sets of events is non-empty

(i) Situation:

D = {e_1,e_2,e_3,e_4,e_5,e_6}

John is an agent = {e_1,e_4,e_5}

run = {e_1,e_3,e_5}

quickly = {e_1,e_2,e_5}

swim = {e_6}

(ii) Derivation

⟦John ran quickly⟧

= John ∩ run ∩ quick

= {e_1,e_4,e_5} ∩ {e_1,e_3,e_5} ∩ {e_1,e_2,e_5}

= {e_1,e_5}

(= True)

(iii) John e_4 e_6 e_5 e_2 running e_1 quickly e_3

(48) Again can also attach to a VP

Normal Example	Context Driven Example
John hugged Mary because she looked sad, She still looked sad so	John's wife hugged Mary because she looked sad, She still looked sad so
(a) [John hugged Mary] again.	(b) John [hugged Mary] again.

(a) $S_{\{e\}}$ [∩ [$S_{\{e\}}$ [$NP_{\{e\}}$ John] [$VP_{\{e\}}$ [V hugged] [NP Mary]]] [$Adv_{\{e\}}$ again]]

(b) $S_{\{e\}}$ [∩ [$NP_{\{e\}}$ John] [$VP_{\{e\}}$ ∩ [$VP_{\{e\}}$ [V hugged] [NP Mary]] [$Adv_{\{e\}}$ again]]]

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