

# **The Complete Lojban Language**

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## Chapter

# 1

## Lojban as We Mangle It in Lojbanistan: About This Book



*coi lojban.*



*coi rodo*

### 1.1 What is Lojban?

Lojban (pronounced “LOZH-bahn”) is a constructed language. Previous versions of the language were called “Loglan” by Dr. James Cooke Brown, who founded the Loglan Project and started the development of the language in 1955. The goals for the language were first described in the open literature in the article “Loglan”, published in *Scientific American*, June, 1960. Made well-known by that article and by occasional references in science fiction (most notably in Robert Heinlein’s novel *The Moon Is A Harsh Mistress* and computer publications, Loglan and Lojban have been built over four decades by dozens of workers and hundreds of supporters, led since 1987 by The Logical Language Group (who are the publishers of this book).

There are thousands of artificial languages (of which Esperanto is the best-known), but Loglan/Lojban has been engineered to make it unique in several ways. The following are the main features of Lojban:

- Lojban is designed to be used by people in communication with each other, and possibly in the future with computers.
- Lojban is designed to be neutral between cultures.
- Lojban grammar is based on the principles of predicate logic.
- Lojban has an unambiguous yet flexible grammar.
- Lojban has phonetic spelling, and unambiguously resolves its sounds into words.
- Lojban is simple compared to natural languages; it is easy to learn.
- Lojban's 1300 root words can be easily combined to form a vocabulary of millions of words.
- Lojban is regular; the rules of the language are without exceptions.
- Lojban attempts to remove restrictions on creative and clear thought and communication.
- Lojban has a variety of uses, ranging from the creative to the scientific, from the theoretical to the practical.
- Lojban has been demonstrated in translation and in original works of prose and poetry.

## 1.2 What is this book?

This book is what is called a “reference grammar”. It attempts to expound the whole Lojban language, or at least as much of it as is understood at present. Lojban is a rich language with many features, and an attempt has been made to discover the functions of those features. The word “discover” is used advisedly; Lojban was not “invented” by any one person or committee. Often, grammatical features were introduced into the language long before their usage was fully understood. Sometimes they were introduced for one reason, only to prove more useful for other reasons not recognized at the time.

By intention, this book is complete in description but not in explanation. For every rule in the formal Lojban grammar (given in Chapter 21), there is a bit of explanation and an example somewhere in the book, and often a great deal more than a bit. In essence, Chapter 2 gives a brief overview of the language, Chapter 21 gives the formal structure of the language, and the chapters in between put semantic bones on that formal flesh. I hope that eventually more grammatical material founded on (or even correcting) the explanations in this book will become available.

Nevertheless, the publication of this book is, in one sense, the completion of a long period of language evolution. With the exception of a possible revision of the language that will not even be considered until five years from publication date, and any revisions of this book needed to correct outright errors, the language described in this book will not be changing by deliberate act of its creators any more. Instead, language change will take place in the form of new vocabulary — Lojban does not yet have nearly the vocabulary it needs to be a fully usable

language of the modern world, as Chapter 12 explains — and through the irregular natural processes of drift and (who knows?) native-speaker evolution. (Teach your children Lojban!) You can learn the language described here with assurance that (unlike previous versions of Lojban and Loglan, as well as most other artificial languages) it will not be subject to further fiddling by language-meisters.

It is probably worth mentioning that this book was written somewhat piecemeal. Each chapter began life as an explication of a specific Lojban topic; only later did these begin to clump together into a larger structure of words and ideas. Therefore, there are perhaps not as many cross-references as there should be. However, I have attempted to make the index as comprehensive as possible.

Each chapter has a descriptive title, often involving some play on words; this is an attempt to make the chapters more memorable. The title of Chapter 1 (which you are now reading), for example, is an allusion to the book *English As We Speak It In Ireland*, by P. W. Joyce, which is sort of informal reference work about Hiberno-English. “Lojbanistan” is both an imaginary country where Lojban is the native language, and a term for the actual community of Lojban-speakers, scattered over the world. Why “mangle”? As yet, nobody in the real Lojbanistan speaks the language at all well, by the standards of the imaginary Lojbanistan; that is one of the circumstances this book is meant to help remedy.

### 1.3 What are the typographical conventions of this book?

Each chapter is broken into numbered sections; each section contains a mixture of expository text, numbered examples, and possibly tables.

The reader will notice a certain similarity in the examples used throughout the book. One chapter after another rings the changes on the self-same sentences:

#### Example 1.3.1

mi klama le zarci  
I go-to that-which-I-describe-as-a store.  
I go to the store.

will become wearisomely familiar before Chapter 21 is reached. This method is deliberate; I have tried to use simple and (eventually) familiar examples wherever possible, to avoid obscuring new grammatical points with new vocabulary. Of course, this is not the method of a textbook, but this book is not a textbook (although people have learned Lojban from it and its predecessors). Rather, it is intended both for self-learning (of course, at present would-be Lojban teachers must be self-learners) and to serve as a reference in the usual sense, for looking up obscure points about the language.

It is useful to talk further about Example 1.3.1 for what it illustrates about examples in this book. Examples usually occupy three lines. The first of these is in Lojban, the second in a word-by-word literal translation of the Lojban into English, and the third in colloquial English. The second and third lines are sometimes called the “literal translation” and the “colloquial translation” respectively. Sometimes, when clarity is not sacrificed thereby, one or both are omitted. If there is more than one Lojban sentence, it generally means that they have the same meaning.

Words are sometimes surrounded by square brackets. In Lojban texts, these enclose optional grammatical particles that may (in the context of the particular example) be either omitted or included. In literal translations, they enclose words that are used as conventional translations of specific Lojban words, but don’t have exactly the meanings or uses that the English

word would suggest. In Chapter 3, square brackets surround phonetic representations in the International Phonetic Alphabet.

Many of the tables, especially those placed at the head of various sections, are in three columns. The first column contains Lojban words discussed in that section; the second column contains the grammatical category (represented by an UPPER CASE Lojban word) to which the word belongs, and the third column contains a brief English gloss, not necessarily or typically a full explanation. Other tables are explained in context.

A few Lojban words are used in this book as technical terms. All of these are explained in Chapter 2, except for a few used only in single chapters, which are explained in the introductory sections of those chapters.

## 1.4 Disclaimers

It is necessary to add, alas, that the examples used in this book do not refer to any existing person, place, or institution, and that any such resemblance is entirely coincidental and unintentional, and not intended to give offense.

When definitions and place structures of *gismu*, and especially of *lujvo*, are given in this book, they may differ from those given in the English-Lojban dictionary (which, as of this writing, is not yet published). If so, the information given in the dictionary supersedes whatever is given here.

## 1.5 Acknowledgements and Credits

Although the bulk of this book was written for the Logical Language Group (LLG) by John Cowan, who is represented by the occasional authorial “I”, certain chapters were first written by others and then heavily edited by me to fit into this book.

In particular: Chapter 2 is a fusion of originally separate documents, one by Athelstan, and one by Nora Tansky LeChevalier and Bob LeChevalier; Chapter 3 and Chapter 4 were originally written by Bob LeChevalier with contributions by Chuck Barton; Chapter 12 was originally written (in much longer form) by Nick Nicholas; the dialogue near the end of Chapter 13 was contributed by Nora Tansky LeChevalier; Chapter 15 and parts of Chapter 16 were originally by Bob LeChevalier; and the YACC grammar in Chapter 21 is the work of several hands, but is primarily by Bob LeChevalier and Jeff Taylor. The BNF grammar, which is also in Chapter 21, was originally written by me, then rewritten by Clark Nelson, and finally touched up by me again.

The research into natural languages from which parts of Chapter 5 draw their material was performed by Ivan Derzhanski. LLG acknowledges his kind permission to use the fruits of his research.

The pictures in this book were drawn by Nora Tansky LeChevalier, except for the picture appearing in Chapter 4, which is by Sylvia Rutiser.

I would like to thank the following people for their detailed reviews, suggestions, comments, and early detection of my embarrassing errors in Lojban, logic, English, and cross-references: Nick Nicholas, Mark Shoulson, Veijo Vilva, Colin Fine, And Rosta, Jorge Llambias, Iain Alexander, Paulo S. L. M. Barreto, Robert J. Chassell, Ivan Derzhanski, Jim Carter, Irene Gates, Bob LeChevalier, John Parks-Clifford (also known as “pc”), and Nora Tansky LeChevalier.

Nick Nicholas (NSN) would like to thank the following Lojbanists: Mark Shoulson, Veijo Vilva, Colin Fine, And Rosta, and Iain Alexander for their suggestions and comments; John Cowan, for his extensive comments, his exemplary trailblazing of Lojban grammar, and for solving the “manskapi” dilemma for NSN; Jorge Llambias, for his even more extensive comments, and for forcing NSN to think more than he was inclined to; Bob LeChevalier, for his skeptical overview of the issue, his encouragement, and for scouring all Lojban text his computer has been burdened with for *lujvo*; Nora Tansky LeChevalier, for writing the program converting old *rafsi* text to new *rafsi* text, and sparing NSN from embarrassing errors; and Jim Carter, for his dogged persistence in analyzing *lujvo* algorithmically, which inspired this research, and for first identifying the three *lujvo* classes.

Of course, the entire Loglan Project owes a considerable debt to James Cooke Brown as the language inventor, and also to several earlier contributors to the development of the language. Especially noteworthy are Doug Landauer, Jeff Prothero, Scott Layson, Jeff Taylor, and Bob McIvor. Final responsibility for the remaining errors and infelicities is solely mine.

## 1.6 Informal Bibliography

The founding document for the Loglan Project, of which this book is one of the products, is *Loglan 1: A Logical Language* by James Cooke Brown (4th ed. 1989, The Loglan Institute, Gainesville, Florida, U.S.A.) The language described therein is not Lojban, but is very close to it and may be considered an ancestral version. It is regrettably necessary to state that nothing in this book has been approved by Dr. Brown, and that the very existence of Lojban is disapproved of by him.

The logic of Lojban, such as it is, owes a good deal to the American philosopher W. v.O. Quine, especially *Word and Object* (1960, M.I.T. Press). Much of Quine’s philosophical writings, especially on observation sentences, reads like a literal translation from Lojban.

The theory of negation expounded in Chapter 15 is derived from a reading of Larry Horn’s work *The Natural History of Negation*.

Of course, neither Brown nor Quine nor Horn is in any way responsible for the uses or misuses I have made of their works.

Depending on just when you are reading this book, there may be three other books about Lojban available: a textbook, a Lojban/English dictionary, and a book containing general information about Lojban. You can probably get these books, if they have been published, from the same place where you got this book. In addition, other books not yet foreseen may also exist.

## 1.7 Captions to Pictures

The following examples list the Lojban caption, with a translation, for the picture at the head of each chapter. If a chapter’s picture has no caption, “(none)” is specified instead.

### Example 1.7.1

coi lojban. coi rodo  
Greetings, O Lojban! Greetings, all-of you

### Example 1.7.2

(none)

**Example 1.7.3**

.i .ai .i .ai .o  
 ⟨*untranslatable*⟩

**Example 1.7.4**

jbobliku  
 Lojbanic-blocks

**Example 1.7.5**

(none)

**Example 1.7.6**

lei re nanmu cu bevri le re nanmu  
 The-mass-of two men carry the two men  
 Two men (jointly) carry two men (both of them).

**Example 1.7.7**

ma drani danfu  
 .i di'e  
 .i di'u  
 .i dei  
 .i ri  
 .i do'i  
 ⟨*What sumti*⟩ is-the-correct type-of-answer?  
 The-next-sentence.  
 The-previous-sentence.  
 This-sentence.  
 The-previous-sentence.  
 An-unspecified-utterance.

**Example 1.7.8**

ko viska re prenu poi bruna la santas.  
 ⟨*You!*⟩ see two persons who-are brothers-of Santa.

**Example 1.7.9**

(none)

**Example 1.7.10**

za'o klama  
 ⟨*superfective*⟩ come/go  
 Something goes (or comes) for too long.

**Example 1.7.11**

le si'o kunti  
 The concept-of emptiness

**Example 1.7.12**  
(none)

**Example 1.7.13**  
.oi ro'i ro'a ro'e  
⟨*Pain!*⟩ ⟨*emotional*⟩ ⟨*social*⟩ ⟨*mental*⟩

**Example 1.7.14**  
(none)

**Example 1.7.15**  
mi na'e lumci le karce  
I other-than wash the car  
I didn't wash the car.

**Example 1.7.16**  
drata mupli pe'u .djan.  
another example ⟨*please*⟩ John  
Another example, John, please!

**Example 1.7.17**  
zai xanlerfu by. ly. .obu .jy by. .abu ny.  
⟨*Shift*⟩ hand-letters l o j b a n  
“Lojban” in the manual alphabet

**Example 1.7.18**  
no no  
0 0

**Example 1.7.19**  
(none)

**Example 1.7.20**  
(none)

**Example 1.7.21**  
(none)

## 1.8 Boring Legalities

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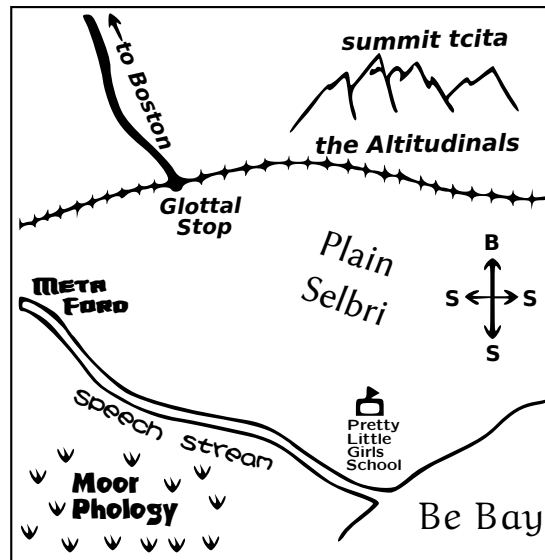
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# A Quick Tour of Lojban Grammar, With Diagrams



## 2.1 The concept of the *bridi*

This chapter gives diagrammed examples of basic Lojban sentence structures. The most general pattern is covered first, followed by successive variations on the basic components of the Lojban sentence. There are many more capabilities not covered in this chapter, but covered in detail in later chapters, so this chapter is a “quick tour” of the material later covered more slowly throughout the book. It also introduces most of the Lojban words used to discuss Lojban grammar.

Let us consider John and Sam and three statements about them:

### Example 2.1.1

John is the father of Sam.

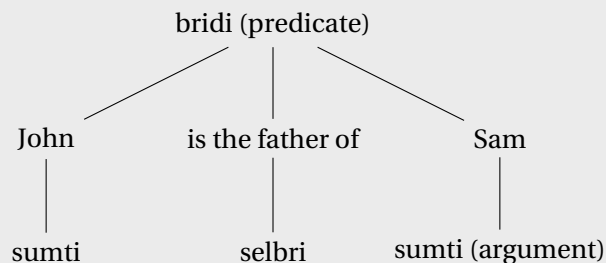
**Example 2.1.2**

John hits Sam.

**Example 2.1.3**

John is taller than Sam.

These examples all describe relationships between John and Sam. However, in English, we use the noun “father” to describe a static relationship in Example 2.1.1, the verb “hits” to describe an active relationship in Example 2.1.2, and the adjective “taller” to describe an attributive relationship in Example 2.1.3. In Lojban we make no such grammatical distinctions; these three sentences, when expressed in Lojban, are structurally identical. The same part of speech is used to represent the relationship. In formal logic this whole structure is called a *predication*; in Lojban it is called a *bridi*, and the central part of speech is the *selbri*. Logicians refer to the things thus related as arguments, while Lojbanists call them *sumti*. These Lojban terms will be used for the rest of the book.

**Diagram 2.1**

In a relationship, there are a definite number of things being related. In English, for example, “give” has three places: the donor, the recipient and the gift. For example:

**Example 2.1.4**

John gives Sam the book.

and

**Example 2.1.5**

Sam gives John the book.

mean two different things because the relative positions of “John” and “Sam” have been switched. Further,

**Example 2.1.6**

The book gives John Sam.

seems strange to us merely because the places are being filled by unorthodox arguments. The relationship expressed by “give” has not changed.

In Lojban, each *selbri* has a specified number and type of arguments, known collectively as its *place structure*. The simplest kind of *selbri* consists of a single root word, called a *gismu*,

and the definition in a dictionary gives the place structure explicitly. The primary task of constructing a Lojban sentence, after choosing the relationship itself, is deciding what you will use to fill in the sumti places.

This book uses the Lojban terms “bridi”, “sumti”, and “selbri”, because it is best to come to understand them independently of the English associations of the corresponding words, which are only roughly similar in meaning anyhow.

The Lojban examples in this chapter (but not in the rest of the book) use a single underline under each sumti, and a double underline under each selbri, to help you to tell them apart.

## 2.2 Pronunciation

Detailed pronunciation and spelling rules are given in Chapter 3, but what follows will keep the reader from going too far astray while digesting this chapter.

Lojban has six recognized vowels: *a*, *e*, *i*, *o*, *u* and *y*. The first five are roughly pronounced as *a* as in “father”, *e* as in “let”, *i* as in “machine”, *o* as in “dome” and *u* as in “flute”. *y* is pronounced as the sound called *schwa*, that is, as the unstressed *a* as in “about” or “around”.

Twelve consonants in Lojban are pronounced more or less as their counterparts are in English: *b*, *d*, *f*, *k*, *l*, *m*, *n*, *p*, *r*, *t*, *v* and *z*. The letter *c*, on the other hand is pronounced as the *sh* in “hush”, while *j* is its voiced counterpart, the sound of the *s* in “pleasure”. *g* is always pronounced as it is in “gift”, never as in “giant”. *s* is as in “sell”, never as in “rose”. The sound of *x* is not found in English in normal words. It is found as *ch* in Scottish “loch”, as *j* in Spanish “junta”, and as *ch* in German “Bach”; it also appears in the English interjection “yecchh!”. It gets easier to say as you practice it. The letter *r* can be trilled, but doesn’t have to be.

The Lojban diphthongs *ai*, *ei*, *oi*, and *au* are pronounced much as in the English words “sigh”, “say”, “boy”, and “how”. Other Lojban diphthongs begin with an *i* pronounced like English *y* (for example, *io* is pronounced *yo*) or else with a *u* pronounced like English *w* (for example, *ua* is pronounced *wa*).

Lojban also has three “semi-letters”: the period, the comma and the apostrophe. The period represents a glottal stop or a pause; it is a required stoppage of the flow of air in the speech stream. The apostrophe sounds just like the English letter *h*. Unlike a regular consonant, it is not found at the beginning or end of a word, nor is it found adjacent to a consonant; it is only found between two vowels. The comma has no sound associated with it, and is used to separate syllables that might ordinarily run together. It is not used in this chapter.

Stress falls on the next to the last syllable of all words, unless that vowel is *y*, which is never stressed; in such words the third-to-last syllable is stressed. If a word only has one syllable, then that syllable is not stressed.

All Lojban words are pronounced as they are spelled: there are no silent letters.

## 2.3 Words that can act as sumti

Here is a short table of single words used as sumti. This table provides examples only, not the entire set of such words, which may be found in Chapter 7.

### Definition 2.1

<i>mi</i>	I/me, we/us
<i>do</i>	you
<i>ti</i>	this, these

<i>ta</i>	that, those
<i>tu</i>	that far away, those far away
<i>zo'e</i>	unspecified value (used when a sumti is unimportant or obvious)

Lojban sumti are not specific as to number (singular or plural), nor gender (masculine/feminine/neutral). Such distinctions can be optionally added by methods that are beyond the scope of this chapter.

The cmavo “ti”, “ta”, and “tu” refer to whatever the speaker is pointing at, and should not be used to refer to things that cannot in principle be pointed at.

Names may also be used as sumti, provided they are preceded with the word “la”:

**Definition 2.2**

<i>la meris.</i>	the one/ones named Mary
<i>la djan.</i>	the one/ones named John

Other Lojban spelling versions are possible for names from other languages, and there are restrictions on which letters may appear in Lojban names: see Chapter 6 for more information.

## 2.4 Some words used to indicate selbri relations

Here is a short table of some words used as Lojban selbri in this chapter:

**Definition 2.3**

<i>vecnu</i>	$x_1$ (seller) sells $x_2$ (goods) to $x_3$ (buyer) for $x_4$ (price)
<i>tavla</i>	$x_1$ (talker) talks to $x_2$ (audience) about $x_3$ (topic) in language $x_4$
<i>sutra</i>	$x_1$ (agent) is fast at doing $x_2$ (action)
<i>blari'o</i>	$x_1$ (object/light source) is blue-green
<i>melbi</i>	$x_1$ (object/idea) is beautiful to $x_2$ (observer) by standard $x_3$
<i>cutci</i>	$x_1$ is a shoe/boot for $x_2$ (foot) made of $x_3$ (material)
<i>bajra</i>	$x_1$ runs on $x_2$ (surface) using $x_3$ (limbs) in manner $x_4$ (gait)
<i>klama</i>	$x_1$ goes/comes to $x_2$ (destination) from $x_3$ (origin point) via $x_4$ (route) using $x_5$ (means of transportation)
<i>pluka</i>	$x_1$ pleases/is pleasing to $x_2$ (experiencer) under conditions $x_3$
<i>gerku</i>	$x_1$ is a dog of breed $x_2$
<i>kurji</i>	$x_1$ takes care of $x_2$
<i>kanro</i>	$x_1$ is healthy by standard $x_2$
<i>stali</i>	$x_1$ stays/remains with $x_2$
<i>zarci</i>	$x_1$ is a market/store/shop selling $x_2$ (products) operated by $x_3$ (storekeeper)

Each selbri (relation) has a specific rule that defines the role of each sumti in the bridi, based on its position. In the table above, that order was expressed by labeling the sumti positions as  $x_1$ ,  $x_2$ ,  $x_3$ , and  $x_4$ .

Like the table in Section 2.3, this table is far from complete: in fact, no complete table can exist, because Lojban allows new words to be created (in specified ways) whenever a speaker or writer finds the existing supply of words inadequate. This notion is a basic difference between Lojban (and some other languages such as German and Chinese) and English; in English, most people are very leery of using words that “aren’t in the dictionary”. Lojbanists are encouraged

to invent new words; doing so is a major way of participating in the development of the language. Chapter 4 explains how to make new words, and Chapter 12 explains how to give them appropriate meanings.

## 2.5 Some simple Lojban bridi

Let's look at a simple Lojban bridi. The place structure of the gismu "tavla" is

### Example 2.5.1

$x_1$  talks to  $x_2$  about  $x_3$  in language  $x_4$

where the  $x$ es with following numbers represent the various arguments that could be inserted at the given positions in the English sentence. For example:

### Example 2.5.2

John talks to Sam about engineering in Lojban.

has "John" in the  $x_1$  place, "Sam" in the  $x_2$  place, "engineering" in the  $x_3$  place, and "Lojban" in the  $x_4$  place, and could be paraphrased:

### Example 2.5.3

Talking is going on, with speaker John and listener Sam and subject matter engineering and language Lojban.

The Lojban bridi corresponding to Example 2.5.1 will have the form

### Example 2.5.4

$x_1$   $\langle cu \rangle$  tavla  $x_2$   $x_3$   $x_4$

The word "cu" serves as a separator between any preceding sumti and the selbri. It can often be omitted, as in the following examples.

### Example 2.5.5

mi tavla do zo'e zo'e  
I talk to you about something in some language.

### Example 2.5.6

do tavla mi ta zo'e  
You talk to me about that thing in a language.

### Example 2.5.7

mi tavla zo'e tu ti  
I talk to someone about that thing yonder in this language.

(Example 2.5.7 is a bit unusual, as there is no easy way to point to a language; one might point to a copy of this book, and hope the meaning gets across!)

When there are one or more occurrences of the cmavo "zo'e" at the end of a bridi, they may be omitted, a process called *ellipsis*. Example 2.5.5 and Example 2.5.6 may be expressed thus:

**Example 2.5.8**

mi tavla do  
I talk to you (about something in some language).

**Example 2.5.9**

do tavla mi ta  
You talk to me about that thing (in some language).

Note that Example 2.5.7 is not subject to ellipsis by this direct method, as the “zo’e” in it is not at the end of the bridi.

## 2.6 Variant bridi structure

Consider the sentence:

**Example 2.6.1**

mi  $\langle cu \rangle$  vecnu ti ta zo’e  
seller- $x_1$  sells goods-sold- $x_2$  buyer- $x_3$  price- $x_4$   
I sell this to that for some price.  
I sell this-thing/these-things to that-buyer/those-buyers.  
(The price is obvious or unimportant.)

Example 2.6.1 has one sumti (the  $x_1$ ) before the selbri. It is also possible to put more than one sumti before the selbri, without changing the order of sumti:

**Example 2.6.2**

mi ti  $\langle cu \rangle$  vecnu ta  
seller- $x_1$  goods-sold- $x_2$  sells buyer- $x_3$   
I this sell to that.  
(translates as stilted or poetic English)  
I this thing do sell to that buyer.

**Example 2.6.3**

mi ti ta  $\langle cu \rangle$  vecnu  
seller- $x_1$  goods-sold- $x_2$  buyer- $x_3$  sells  
I this to-that sell.  
(translates as stilted or poetic English)  
I this thing to that buyer do sell.

Example 2.6.1 through Example 2.6.3 mean the same thing. Usually, placing more than one sumti before the selbri is done for style or for emphasis on the sumti that are out-of-place from their normal position. (Native speakers of languages other than English may prefer such orders.)

If there are no sumti before the selbri, then it is understood that the  $x_1$  sumti value is equivalent to “zo’e”; i.e. unimportant or obvious, and therefore not given. Any sumti after the selbri start counting from  $x_2$ .

**Example 2.6.4**

ta <cu> melbi  
 object/idea- $x_1$  is-beautiful (to someone by some standard)  
 That/Those is/are beautiful.  
 That is beautiful.  
 Those are beautiful.

when the  $x_1$  is omitted, becomes:

**Example 2.6.5**

melbi  
 unspecified- $x_1$  is-beautiful (to someone by some standard)  
 Beautiful!  
 It's beautiful!

Omitting the  $x_1$  adds emphasis to the selbri relation, which has become first in the sentence. This kind of sentence is termed an *observative*, because it is often used when someone first observes or takes note of the relationship, and wishes to quickly communicate it to someone else. Commonly understood English observatives include “Smoke!” upon seeing smoke or smelling the odor, or “Car!” to a person crossing the street who might be in danger. Any Lojban selbri can be used as an observative if no sumti appear before the selbri.

The word “cu” does not occur in an observative; “cu” is a separator, and there must be a sumti before the selbri that needs to be kept separate for “cu” to be used. With no sumti preceding the selbri, “cu” is not permitted. Short words like “cu” which serve grammatical functions are called *cmavo* in Lojban.

## 2.7 Varying the order of sumti

For one reason or another you may want to change the order, placing one particular sumti at the front of the bridi. The cmavo “se”, when placed before the last word of the selbri, will switch the meanings of the first and second sumti places. So

**Example 2.7.1**

mi tavla do ti  
 I talk to you about this.

has the same meaning as

**Example 2.7.2**

do se tavla mi ti  
 You are talked to by me about this.

The cmavo “te”, when used in the same location, switches the meanings of the first and the third sumti places.

**Example 2.7.3**

mi tavla do ti  
 I talk to you about this.

has the same meaning as

**Example 2.7.4**

ti te tavla do mi  
This is talked about to you by me.

Note that only the first and third sumti have switched places; the second sumti has remained in the second place.

The cmavo “ve” and “xe” switch the first and fourth sumti places, and the first and fifth sumti places, respectively. These changes in the order of places are known as *conversions*, and the “se”, “te”, “ve”, and “xe” cmavo are said to convert the selbri.

More than one of these operators may be used on a given selbri at one time, and in such a case they are evaluated from left to right. However, in practice they are used one at a time, as there are better tools for complex manipulation of the sumti places. See Chapter 5 for details.

The effect is similar to what in English is called the *passive voice*. In Lojban, the converted selbri has a new place structure that is renumbered to reflect the place reversal, thus having effects when such a conversion is used in combination with other constructs such as “le selbri <ku>” (see Section 2.10).

## 2.8 The basic structure of longer utterances

People don’t always say just one sentence. Lojban has a specific structure for talk or writing that is longer than one sentence. The entirety of a given speech event or written text is called an utterance. The sentences (usually, but not always, bridji) in an utterance are separated by the cmavo “ni’o” and “.i”. These correspond to a brief pause (or nothing at all) in spoken English, and the various punctuation marks like period, question mark, and exclamation mark in written English. These separators prevent the sumti at the beginning of the next sentence from being mistaken for a trailing sumti of the previous sentence.

The cmavo “ni’o” separates paragraphs (covering different topics of discussion). In a long text or utterance, the topical structure of the text may be indicated by multiple “ni’o”s, with perhaps “ni’oni’oni’o” used to indicate a chapter, “ni’oni’o” to indicate a section, and a single “ni’o” to indicate a subtopic corresponding to a single English paragraph.

The cmavo “.i” separates sentences. It is sometimes compounded with words that modify the exact meaning (the semantics) of the sentence in the context of the utterance. (The cmavo “xu”, discussed in Section 2.17, is one such word — it turns the sentence from a statement to a question about truth.) When more than one person is talking, a new speaker will usually omit the “.i” even though she/he may be continuing on the same topic.

It is still O.K. for a new speaker to say the “.i” before continuing; indeed, it is encouraged for maximum clarity (since it is possible that the second speaker might merely be adding words onto the end of the first speaker’s sentence). A good translation for “.i” is the “and” used in run-on sentences when people are talking informally: “I did this, and then I did that, and ..., and ...”.

## 2.9 tanru

When two gismu are adjacent, the first one modifies the second, and the selbri takes its place structure from the rightmost word. Such combinations of gismu are called *tanru*. For example,



**Example 2.9.1**

sutra tavla

has the place structure

**Example 2.9.2** $x_1$  is a fast type-of talker to  $x_2$  about  $x_3$  in language  $x_4$  $x_1$  talks fast to  $x_2$  about  $x_3$  in language  $x_4$ 

When three or more gismu are in a row, the first modifies the second, and that combined meaning modifies the third, and that combined meaning modifies the fourth, and so on. For example

**Example 2.9.3**

sutra tavla cutci

has the place structure

**Example 2.9.4** $s_1$  is a fast-talker type of shoe worn by  $s_2$  of material  $s_3$ 

That is, it is a shoe that is worn by a fast talker rather than a shoe that is fast and is also worn by a talker.

Note especially the use of “type-of” as a mechanism for connecting the English translations of the two or more gismu; this convention helps the learner understand each tanru in its context. Creative interpretations are also possible, however:

**Example 2.9.5**bajra cutci  
runner shoe

most probably refers to shoes suitable for runners, but might be interpreted in some imaginative instances as “shoes that run (by themselves?)”. In general, however, the meaning of a tanru is determined by the literal meaning of its components, and not by any connotations or figurative meanings. Thus

**Example 2.9.6**sutra tavla  
fast-talker

would not necessarily imply any trickery or deception, unlike the English idiom, and a

**Example 2.9.7**jikca toldi  
social butterfly

must always be an insect with large brightly-colored wings, of the family *Lepidoptera*.

The place structure of a tanru is always that of the final component of the tanru. Thus, the following has the place structure of “klama”:

**Example 2.9.8**

mi  $\langle cu \rangle$  sutra klama la meris.  
I quickly-go to Mary.

With the conversion “se klama” as the final component of the tanru, the place structure of the entire selbri is that of “se klama”: the  $x_1$  place is the destination, and the  $x_2$  place is the one who goes:

**Example 2.9.9**

mi  $\langle cu \rangle$  sutra se klama la meris.  
I quickly am-gone-to by Mary.

The following example shows that there is more to conversion than merely switching places, though:

**Example 2.9.10**

la tam.  $\langle cu \rangle$  melbi tavla la meris.  
Tom beautifully-talks to Mary.  
Tom is a beautiful-talker to Mary.

has the place structure of “tavla”, but note the two distinct interpretations. Now, using conversion, we can modify the place structure order:

**Example 2.9.11**

la meris.  $\langle cu \rangle$  melbi se tavla la tam.  
Mary is beautifully-talked-to by Tom.  
Mary is a beautiful-audience for Tom.

and we see that the modification has been changed so as to focus on Mary’s role in the bridged relationship, leading to a different set of possible interpretations.

Note that there is no place structure change if the modifying term is converted, and so less drastic variation in possible meanings:

**Example 2.9.12**

la tam.  $\langle cu \rangle$  tavla melbi la meris.  
Tom is talkerly-beautiful to Mary.

**Example 2.9.13**

la tam.  $\langle cu \rangle$  se tavla melbi la meris. Tom is audiencely-beautiful to Mary.

and we see that the manner in which Tom is seen as beautiful by Mary changes, but Tom is still the one perceived as beautiful, and Mary, the observer of beauty.

## 2.10 Description sumti

Often we wish to talk about things other than the speaker, the listener and things we can point to. Let’s say I want to talk about a talker other than “mi”. What I want to talk about would

naturally fit into the first place of “tavla”. Lojban, it turns out, has an operator that pulls this first place out of a selbri and converts it to a sumti called a *description sumti*. The description sumti “le tavla ku” means “the talker”, and may be used wherever any sumti may be used.

For example,

**Example 2.10.1**

mi tavla do le tavla ku

means the same as

**Example 2.10.2**

I talk to you about the talker

where “the talker” is presumably someone other than me, though not necessarily.

Similarly “le sutra tavla ku” is “the fast talker”, and “le sutra te tavla ku” is “the fast subject of talk” or “the subject of fast talk”. Which of these related meanings is understood will depend on the context in which the expression is used. The most plausible interpretation within the context will generally be assumed by a listener to be the intended one.

In many cases the word “ku” may be omitted. In particular, it is never necessary in a description at the end of a sentence, so:

**Example 2.10.3**

mi tavla do le tavla  $\langle$ ku $\rangle$   
I talk-to you about-the talker

means exactly the same thing as Example 2.10.1.

There is a problem when we want to say “The fast one is talking.” The “obvious” translation “le sutra tavla” turns out to mean “the fast talker”, and has no selbri at all. To solve this problem we can use the word “cu”, which so far has always been optional, in front of the selbri.

The word “cu” has no meaning, and exists only to mark the beginning of the selbri within the bridi, separating it from a previous sumti. It comes before any other part of the selbri, including other cmavo like “se” or “te”. Thus:

**Example 2.10.4**

le sutra tavla  
The fast talker

**Example 2.10.5**

le sutra cu tavla  
The fast one is talking.

**Example 2.10.6**

le sutra se tavla  
The fast talked-to one

**Example 2.10.7**

le sutra cu se tavla  
The fast one is talked to.

Consider the following more complex example, with two description sumti.

**Example 2.10.8**

mi <cu> tavla le vecnu <ku> le blari'o <ku>  
I talk-to the seller about the blue-green-thing.

The sumti “le vecnu” contains the selbri “vecnu”, which has the seller in the  $x_1$  place, and uses it in this sentence to describe a particular seller that the speaker has in mind (one that he or she probably expects the listener will also know about). Similarly, the speaker has a particular blue-green thing in mind, which is described using “le” to mark “blari'o”, a selbri whose first sumti is something blue-green.

It is safe to omit both occurrences of “ku” in Example 2.10.8, and it is also safe to omit the “cu”.

## 2.11 Examples of brivla

The simplest form of selbri is an individual word. A word which may by itself express a selbri relation is called a *brivla*. The three types of brivla are gismu (root words), lujvo (compounds), and fu'ivla (borrowings from other languages). All have identical grammatical uses. So far, most of our selbri have been gismu or tanru built from gismu.

gismu:

**Example 2.11.1**

mi <cu> klama ti zo'e zo'e ta  
Go-er goes destination origin route means.  
I go here (to this) using that means (from somewhere via some route).

lujvo:

**Example 2.11.2**

ta <cu> blari'o  
That is-blue-green.

fu'ivla:

**Example 2.11.3**

ti <cu> djarspageti  
This is-spaghetti.

Some cmavo may also serve as selbri, acting as variables that stand for another selbri. The most commonly used of these is “go'i”, which represents the main bridi of the previous Lojban sentence, with any new sumti or other sentence features being expressed replacing the previously expressed ones. Thus, in this context:

**Example 2.11.4**

ta <cu> go'i  
That too/same-as-last selbri.  
That (is spaghetti), too.

## 2.12 The sumti *di'u* and *la'e di'u*

In English, I might say “The dog is beautiful”, and you might reply “This pleases me.” How do you know what “this” refers to? Lojban uses different expressions to convey the possible meanings of the English:

### Example 2.12.1

le gerku *<ku>* cu melbi  
The dog is beautiful.

The following three sentences all might translate as “This pleases me.”

### Example 2.12.2

ti *<cu>* pluka mi  
This (the dog) pleases me.

### Example 2.12.3

di'u *<cu>* pluka mi  
This (the last sentence) pleases me (perhaps because it is grammatical or sounds nice).

### Example 2.12.4

la'e di'u *<cu>* pluka  
This (the meaning of the last sentence; i.e. that the dog is beautiful) pleases me.

Example 2.12.4 uses one sumti to point to or refer to another by inference. It is common to write “la'edi'u” as a single word; it is used more often than “di'u” by itself.

## 2.13 Possession

“Possession” refers to the concept of specifying an object by saying who it belongs to (or with). A full explanation of Lojban possession is given in Chapter 8. A simple means of expressing possession, however, is to place a sumti representing the possessor of an object within the description sumti that refers to the object: specifically, between the “le” and the selbri of the description:

### Example 2.13.1

le mi gerku cu sutra  
The of-me dog is fast.  
My dog is fast.

In Lojban, possession doesn't necessarily mean ownership: one may “possess” a chair simply by sitting on it, even though it actually belongs to someone else. English uses possession casually in the same way, but also uses it to refer to actual ownership or even more intimate relationships: “my arm” doesn't mean “some arm I own” but rather “the arm that is part of my body”. Lojban has methods of specifying all these different kinds of possession precisely and easily.

## 2.14 Vocatives and commands

You may call someone’s attention to the fact that you are addressing them by using “doi” followed by their name. The sentence

**Example 2.14.1**  
doi djan.

means “Oh, John, I’m talking to you”. It also has the effect of setting the value of “do”; “do” now refers to “John” until it is changed in some way in the conversation. Note that Example 2.14.1 is not a bridi, but it is a legitimate Lojban sentence nevertheless; it is known as a “vocative phrase”.

Other cmavo can be used instead of “doi” in a vocative phrase, with a different significance. For example, the cmavo “coi” means “hello” and “co’o” means “good-bye”. Either word may stand alone, they may follow one another, or either may be followed by a pause and a name. (Vocative phrases with “doi” do not need a pause before the name.)

**Example 2.14.2**  
coi. djan.  
Hello, John.

**Example 2.14.3**  
co’o. djan.  
Good-bye, John.

Commands are expressed in Lojban by a simple variation of the main bridi structure. If you say

**Example 2.14.4**  
do tavla  
You are-talking.

you are simply making a statement of fact. In order to issue a command in Lojban, substitute the word “ko” for “do”. The bridi

**Example 2.14.5**  
ko tavla

instructs the listener to do whatever is necessary to make Example 2.14.4 true; it means “Talk!” Other examples:

**Example 2.14.6**  
ko sutra  
Be fast!

The “ko” need not be in the  $x_1$  place, but rather can occur anywhere a sumti is allowed, leading to possible Lojban commands that are very unlike English commands:

**Example 2.14.7**

mi tavla ko  
 Be talked to by me  
 Let me talk to you.

The cmavo “ko” can fill any appropriate sumti place, and can be used as often as is appropriate for the selbri:

**Example 2.14.8**

ko kurji ko

and

**Example 2.14.9**

ko ko kurji

both mean “You take care of you” and “Be taken care of by you”, or to put it colloquially, “Take care of yourself”.

## 2.15 Questions

There are many kinds of questions in Lojban: full explanations appear in Chapter 19 and in various other chapters throughout the book. In this chapter, we will introduce three kinds: sumti questions, selbri questions, and yes/no questions.

The cmavo “ma” is used to create a sumti question: it indicates that the speaker wishes to know the sumti which should be placed at the location of the “ma” to make the bridi true. It can be translated as “Who?” or “What?” in most cases, but also serves for “When?”, “Where?”, and “Why?” when used in sumti places that express time, location, or cause. For example:

**Example 2.15.1**

ma tavla do mi  
 Who? talks to-you about-me.  
 Who is talking to you about me?

The listener can reply by simply stating a sumti:

**Example 2.15.2**

la djan.  
 John (is talking to you about me).

Like “ko”, “ma” can occur in any position where a sumti is allowed, not just in the first position:

**Example 2.15.3**

do (*cu*) tavla ma  
 You talk to what/whom?

A “ma” can also appear in multiple sumti positions in one sentence, in effect asking several questions at once.

**Example 2.15.4**

ma <cu> tavla ma  
What/Who talks to what/whom?

The two separate “ma” positions ask two separate questions, and can therefore be answered with different values in each sumti place. The cmavo “mo” is the selbri analogue of “ma”. It asks the respondent to provide a selbri that would be a true relation if inserted in place of the “mo”:

**Example 2.15.5**

do <cu> mo  
You are-what/do-what?

A “mo” may be used anywhere a brivla or other selbri might. Keep this in mind for later examples. Unfortunately, by itself, “mo” is a very non-specific question. The response to the question in Example 2.15.5 could be:

**Example 2.15.6**

mi <cu> melbi  
I am beautiful.

or:

**Example 2.15.7**

mi <cu> tavla  
I talk.

Clearly, “mo” requires some cooperation between the speaker and the respondent to ensure that the right question is being answered. If context doesn’t make the question specific enough, the speaker must ask the question more specifically using a more complex construction such as a tanru (see Section 2.9).

It is perfectly permissible for the respondent to fill in other unspecified places in responding to a “mo” question. Thus, the respondent in Example 2.15.7 could have also specified an audience, a topic, and/or a language in the response.

Finally, we must consider questions that can be answered “Yes” or “No”, such as

**Example 2.15.8**

Are you talking to me?

Like all yes-or-no questions in English, Example 2.15.8 may be reformulated as

**Example 2.15.9**

Is it true that you are talking to me?

In Lojban we have a word that asks precisely that question in precisely the same way. The cmavo “xu”, when placed in front of a bridi, asks whether that bridi is true as stated. So

**Example 2.15.10**

xu do tavla mi  
Is-it-true-that you are-talking to-me?



is the Lojban translation of Example 2.15.8.

The answer “Yes” may be given by simply restating the bridi without the “xu” question word. Lojban has a shorthand for doing this with the word “go’i”, mentioned in Section 2.11. Instead of a negative answer, the bridi may be restated in such a way as to make it true. If this can be done by substituting sumti, it may be done with “go’i” as well. For example:

**Example 2.15.11**

xu do kanro  
Are you healthy?

can be answered with

**Example 2.15.12**

mi kanro  
I am healthy.

or

**Example 2.15.13**

go’i  
I am healthy.

(Note that “do” to the questioner is “mi” to the respondent.) or

**Example 2.15.14**

le tavla cu kanro  
The talker is healthy.

or

**Example 2.15.15**

le tavla cu go’i  
The talker is healthy.

A general negative answer may be given by “na go’i”. “na” may be placed before any selbri (but after the “cu”). It is equivalent to stating “It is not true that ...” before the bridi. It does not imply that anything else is true or untrue, only that that specific bridi is not true. More details on negative statements are available in Chapter 15.

## 2.16 Indicators

Different cultures express emotions and attitudes with a variety of intonations and gestures that are not usually included in written language. Some of these are available in some languages as interjections (i.e. Aha!, Oh no!, Ouch!, Aahh!, etc.), but they vary greatly from culture to culture.

Lojban has a group of cmavo known as “attitudinal indicators” which specifically covers this type of commentary on spoken statements. They are both written and spoken, but require no specific intonation or gestures. Grammatically they are very simple: one or more attitudinals at the beginning of a bridi apply to the entire bridi; anywhere else in the bridi they apply to the word immediately to the left. For example:

**Example 2.16.1**

.ie mi <cu> klama  
 Agreement! I go.  
 Yep! I'll go.

**Example 2.16.2**

.ei mi <cu> klama  
 Obligation! I go.  
 I should go.

**Example 2.16.3**

mi <cu> klama le melbi .ui <ku>  
 I go to the beautiful-thing (and I am happy because it is the beautiful thing I'm going to).

Not all indicators indicate attitudes. Discursives, another group of cmavo with the same grammatical rules as attitudinal indicators, allow free expression of certain kinds of commentary about the main utterances. Using discursives allows a clear separation of these so-called “metalinguistic” features from the underlying statements and logical structure. By comparison, the English words “but” and “also”, which discursively indicate contrast or an added weight of example, are logically equivalent to “and”, which does not have a discursive content. The average English-speaker does not think about, and may not even realize, the paradoxical idea that “but” basically means “and”.

**Example 2.16.4**

mi <cu> klama.i do <cu> stali  
 I go. You stay.

**Example 2.16.5**

mi <cu> klama.i ji'a do <cu> stali  
 I go. In addition, you stay. (added weight)

**Example 2.16.6**

mi <cu> klama.i ku'i do <cu> stali  
 I go. However, you stay. (contrast)

Another group of indicators are called *evidentials*. Evidentials show the speaker's relationship to the statement, specifically how the speaker came to make the statement. These include “za'a” (I directly observe the relationship), “pe'i” (I believe that the relationship holds), “ru'a” (I postulate the relationship), and others. Many American Indian languages use this kind of words.

**Example 2.16.7**

pe'i do <cu> melbi  
 I opine! You are beautiful.

**Example 2.16.8**

za'a do *<cu>* melbi  
I directly observe! You are beautiful.

## 2.17 Tenses

In English, every verb is tagged for the grammatical category called tense: past, present, or future. The sentence

**Example 2.17.1**

John went to the store

necessarily happens at some time in the past, whereas

**Example 2.17.2**

John is going to the store

is necessarily happening right now. The Lojban sentence

**Example 2.17.3**

la djan. *<cu>* klama le zarci  
John goes/went/will go to-the store

serves as a translation of either Example 2.17.1 or Example 2.17.2, and of many other possible English sentences as well. It is not marked for tense, and can refer to an event in the past, the present or the future. This rule does not mean that Lojban has no way of representing the time of an event. A close translation of Example 2.17.1 would be:

**Example 2.17.4**

la djan. pu klama le zarci  
John *<past>* goes to-the store

where the tag “pu” forces the sentence to refer to a time in the past. Similarly,

**Example 2.17.5**

la djan. ca klama le zarci  
John *<present>* goes to-the store

necessarily refers to the present, because of the tag “ca”. Tags used in this way always appear at the very beginning of the selbri, just after the “cu”, and they may make a “cu” unnecessary, since tags cannot be absorbed into tanru. Note that Example 2.17.3 has and requires a “cu” to prevent “bajra” and “klama” from forming a tanru, but Example 2.17.4 and Example 2.17.5 lack the unnecessary “cu”. Such tags serve as an equivalent to English tenses and adverbs. In Lojban, tense information is completely optional. If unspecified, the appropriate tense is picked up from context.

Lojban also extends the notion of “tense” to refer not only to time but to space. The following example uses the tag “vu” to specify that the event it describes happens far away from the speaker:

**Example 2.17.6**

do <cu> vu vecnu  
 You yonder sell something-unspecified.

In addition, tense tags (either for time or space) can be prefixed to the selbri of a description, producing a tensed sumti:

**Example 2.17.7**

le pu bajra <ku> cu tavla  
 The earlier/former/past runner talked/talks.

(Since Lojban tense is optional, we don't know when he or she talks.)

Tensed sumti with space tags correspond roughly to the English use of “this” or “that” as adjectives, as in the following example, which uses the tag “vi” meaning “nearby”:

**Example 2.17.8**

le vi bajra <ku> cu tavla  
 The nearby runner talks.  
 This runner talks.

Do not confuse the use of “vi” in Example 2.17.8 with the cmavo “ti”, which also means “this”, but in the sense of “this thing”.

Furthermore, a tense tag can appear both on the selbri and within a description, as in the following example (where “ba” is the tag for future time):

**Example 2.17.9**

le vi tavla <ku> cu ba klama  
 The here talker <future> goes.  
 The talker who is here will go  
 This talker will go.

## 2.18 Lojban grammatical terms

Here is a review of the Lojban grammatical terms used in this chapter, plus some others used throughout this book. Only terms that are themselves Lojban words are included: there are of course many expressions like “indicator” in Chapter 16 that are not explained here. See the Index for further help with these.

**Definition 2.4**

<i>bridi</i>	predication; the basic unit of Lojban expression; the main kind of Lojban sentence; a claim that some objects stand in some relationship, or that some single object has some property.
<i>sumti</i>	argument; words identifying something which stands in a specified relationship to something else, or which has a specified property. See Chapter 6.
<i>selbri</i>	logical predicate; the core of a bridi; the word or words specifying the relationship between the objects referred to by the sumti. See Chapter 5.
<i>cmavo</i>	one of the Lojban parts of speech; a short word; a structural word; a word used for its grammatical function.

<i>brivla</i>	one of the Lojban parts of speech; a content word; a predicate word; can function as a selbri; is a gismu, a lujvo, or a fu'ivla. See Chapter 4.
<i>gismu</i>	a root word; a kind of brivla; has associated rafsi. See Chapter 4.
<i>lujvo</i>	a compound word; a kind of brivla; may or may not appear in a dictionary; does not have associated rafsi. See Chapter 4 and Chapter 12.
<i>fu'ivla</i>	a borrowed word; a kind of brivla; may or may not appear in a dictionary; copied in a modified form from some non-Lojban language; usually refers to some aspect of culture or the natural world; does not have associated rafsi. See Chapter 4.
<i>rafsi</i>	a word fragment; one or more is associated with each gismu; can be assembled according to rules in order to make lujvo; not a valid word by itself. See Chapter 4.
<i>tanru</i>	a group of two or more brivla, possibly with associated cmavo, that form a selbri; always divisible into two parts, with the first part modifying the meaning of the second part (which is taken to be basic). See Chapter 5.
<i>selma'o</i>	a group of cmavo that have the same grammatical use (can appear interchangeably in sentences, as far as the grammar is concerned) but differ in meaning or other usage. See Chapter 20.



## Chapter

## 3

# The Hills Are Alive With the Sounds of Lojban



### 3.1 Orthography

Lojban is designed so that any properly spoken Lojban utterance can be uniquely transcribed in writing, and any properly written Lojban can be spoken so as to be uniquely reproduced by another person. As a consequence, the standard Lojban orthography must assign to each distinct sound, or phoneme, a unique letter or symbol. Each letter or symbol has only one sound or, more accurately, a limited range of sounds that are permitted pronunciations for that phoneme. Some symbols indicate stress (speech emphasis) and pause, which are also

essential to Lojban word recognition. In addition, everything that is represented in other languages by punctuation (when written) or by tone of voice (when spoken) is represented in Lojban by words. These two properties together are known technically as “audio-visual isomorphism”.

Lojban uses a variant of the Latin (Roman) alphabet, consisting of the following letters and symbols:

**Definition 3.1**

*Lojban alphabet* ‘, . a b c d e f g i j k l m n o p r s t u v x y z

omitting the letters *h*, *q*, and *w*.

The alphabetic order given above is that of the ASCII coded character set, widely used in computers. By making Lojban alphabetical order the same as ASCII, computerized sorting and searching of Lojban text is facilitated.

Capital letters are used only to represent non-standard stress, which can appear only in the representation of Lojbanized names. Thus the English name “Josephine”, as normally pronounced, is Lojbanized as “DJOsefin.”, pronounced /ˈdʒo se fin?/. (See Section 3.2 for an explanation of the symbols within square brackets.) Technically, it is sufficient to capitalize the vowel letter, in this case *O*, but it is easier on the reader to capitalize the whole syllable.

Without the capitalization, the ordinary rules of Lojban stress would cause the “se” syllable to be stressed. Lojbanized names are meant to represent the pronunciation of names from other languages with as little distortion as may be; as such, they are exempt from many of the regular rules of Lojban phonology, as will appear in the rest of this chapter.

## 3.2 Basic Phonetics

Lojban pronunciations are defined using the International Phonetic Alphabet, or IPA, a standard method of transcribing pronunciations. By convention, IPA transcriptions are always within slashes: for example, the word “cat” is pronounced (in General American pronunciation) /kæt/. Section 3.10 contains a brief explanation of the IPA characters used in this chapter, with their nearest analogues in English, and will be especially useful to those not familiar with the technical terms used in describing speech sounds.

The standard pronunciations and permitted variants of the Lojban letters are listed in the table below. The descriptions have deliberately been made a bit ambiguous to cover variations in pronunciation by speakers of different native languages and dialects. In all cases except “r” the first IPA symbol shown represents the preferred pronunciation; for “r”, all of the variations (and any other rhotic sound) are equally acceptable.

**Definition 3.2**

'	/h/	a unvoiced glottal spirant
,	/:/	the syllable separator
.	/ʔ/	a glottal stop or a pause
<i>a</i>	/a/, /ɑ/	an open vowel
<i>b</i>	/b/	a voiced bilabial stop
<i>c</i>	/ʃ/, /s̺/	an unvoiced coronal sibilant
<i>d</i>	/d/	a voiced dental/alveolar stop
<i>e</i>	/ɛ/, /e/	a front mid vowel



<i>f</i>	/f/, /ɸ/	an unvoiced labial fricative
<i>g</i>	/g/	a voiced velar stop
<i>i</i>	/i/	a front close vowel
<i>j</i>	/ɟ/, /zɟ/	a voiced coronal sibilant
<i>k</i>	/k/	an unvoiced velar stop
<i>l</i>	/l/, /ɭ/	a voiced lateral approximant (may be syllabic)
<i>m</i>	/m/, /ɱ/	a voiced bilabial nasal (may be syllabic)
<i>n</i>	/n/, /ɳ/, /ŋ/, /ɲ/	a voiced dental or velar nasal (may be syllabic)
<i>o</i>	/o/, /ɔ/	a back mid vowel
<i>p</i>	/p/	an unvoiced bilabial stop
<i>r</i>	/r/, /ɹ/, /ɻ/, /R/, /ɽ/, /ɺ/, /ɾ/, /ʀ/	a rhotic sound
<i>s</i>	/s/	an unvoiced alveolar sibilant
<i>t</i>	/t/	an unvoiced dental/alveolar stop
<i>u</i>	/u/	a back close vowel
<i>v</i>	/v/, /β/	a voiced labial fricative
<i>x</i>	/x/	an unvoiced velar fricative
<i>y</i>	/ə/	a central mid vowel
<i>z</i>	/z/	a voiced alveolar sibilant

The Lojban sounds must be clearly pronounced so that they are not mistaken for each other. Voicing and placement of the tongue are the key factors in correct pronunciation, but other subtle differences will develop between consonants in a Lojban-speaking community. At this point these are the only mandatory rules on the range of sounds.

Note in particular that Lojban vowels can be pronounced with either rounded or unrounded lips; typically *o* and *u* are rounded and the others are not, as in English, but this is not a requirement; some people round *y* as well. Lojban consonants can be aspirated or unaspirated. Palatalizing of consonants, as found in Russian and other languages, is not generally acceptable in pronunciation, though a following *i* may cause it.

The sounds represented by the letters *c*, *g*, *j*, *s*, and *x* require special attention for speakers of English, either because they are ambiguous in the orthography of English (*c*, *g*, *s*), or because they are strikingly different in Lojban (*c*, *j*, *x*). The English *c* represents three different sounds, /k/ in “cat” and /s/ in “cent”, as well as the /ʃ/ of “ocean”. Similarly, English *g* can represent /g/ as in “go”, /dʒ/ as in “gentle”, and /ɟ/ as in “garage” (in some pronunciations). English *s* can be either /s/ as in “cats”, /z/ as in “cards”, /ʃ/ as in “tension”, or /ʒ/ as in “measure”. The sound of Lojban *x* doesn’t appear in most English dialects at all.

There are two common English sounds that are found in Lojban but are not Lojban consonants: the *ch* of “church” and the *j* of “judge”. In Lojban, these are considered two consonant sounds spoken together without an intervening vowel sound, and so are represented in Lojban by the two separate consonants: *tc* (IPA /tʃ/) and *dj* (IPA /dʒ/). In general, whether a complex sound is considered one sound or two depends on the language: Russian views *ts* as a single sound, whereas English, French, and Lojban consider it to be a consonant cluster.

### 3.3 The Special Lojban Characters

The apostrophe, period, and comma need special attention. They are all used as indicators of a division between syllables, but each has a different pronunciation, and each is used for different reasons:

The apostrophe represents a phoneme similar to a short, breathy English *h*, (IPA /h/). The letter *h* is not used to represent this sound for two reasons: primarily in order to simplify explanations of the morphology, but also because the sound is very common, and the apostrophe is a visually lightweight representation of it. The apostrophe sound is a consonant in nature, but is not treated as either a consonant or a vowel for purposes of Lojban morphology (word-formation), which is explained in Chapter 4. In addition, the apostrophe visually parallels the comma and the period, which are also used (in different ways) to separate syllables.

The apostrophe is included in Lojban only to enable a smooth separation between vowels, while joining the vowels within a single word. In fact, one way to think of the apostrophe is as representing a unvoiced vowel glide.

As a permitted variant, any unvoiced fricative other than those already used in Lojban may be used to render the apostrophe: IPA /t/ is one possibility. The convenience of the listener should be regarded as paramount in deciding to use a substitute for /h/.

The period represents a mandatory pause, with no specified length; a glottal stop (IPA /ʔ/) is considered a pause of shortest length. A pause (or glottal stop) may appear between any two words, and in certain cases — explained in detail in Chapter 4 — must occur. In particular, a word beginning with a vowel is always preceded by a pause, and a word ending in a consonant is always followed by a pause.

Technically, the period is an optional reminder to the reader of a mandatory pause that is dictated by the rules of the language; because these rules are unambiguous, a missing period can be inferred from otherwise correct text. Periods are included only as an aid to the reader.

A period also may be found apparently embedded in a word. When this occurs, such a written string is not one word but two, written together to indicate that the writer intends a unitary meaning for the compound. It is not really necessary to use a space between words if a period appears.

The comma is used to indicate a syllable break within a word, generally one that is not obvious to the reader. Such a comma is written to separate syllables, but indicates that there must be no pause between them, in contrast to the period. Between two vowels, a comma indicates that some type of glide may be necessary to avoid a pause that would split the two syllables into separate words. It is always legal to use the apostrophe (IPA /h/) sound in pronouncing a comma. However, a comma cannot be pronounced as a pause or glottal stop between the two letters separated by the comma, because that pronunciation would split the word into two words.

Otherwise, a comma is usually only used to clarify the presence of syllabic *l*, *m*, *n*, or *r* (discussed later). Commas are never required: no two Lojban words differ solely because of the presence or placement of a comma.

Here is a somewhat artificial example of the difference in pronunciation between periods, commas and apostrophes. In the English song about Old MacDonald's Farm, the vowel string which is pronounced "ee-i-ee-i-o" in English could be Lojbanized with periods as:

**Example 3.3.1**

```
.i.ai.i.ai.o
/?i ?aj ?i ?aj ?o/
Ee! Eye! Ee! Eye! Oh!
```

However, this would sound clipped, staccato, and unmusical compared to the English. Furthermore, although Example 3.3.1 is a string of meaningful Lojban words, as a sentence it makes very little sense. (Note the use of periods embedded within the written word.)

If commas were used instead of periods, we could represent the English string as a Lojbanized name, ending in a consonant:

**Example 3.3.2**

.i,ai,i,ai,on.  
/ʔi jaj ji jaj jonʔ/

The commas represent new syllable breaks, but prohibit the use of pauses or glottal stop. The pronunciation shown is just one possibility, but closely parallels the intended English pronunciation.

However, the use of commas in this way is risky to unambiguous interpretation, since the glides might be heard by some listeners as diphthongs, producing something like

**Example 3.3.3**

.i,iai,ii,iai,ion.

which is technically a different Lojban name. Since the intent with Lojbanized names is to allow them to be pronounced more like their native counterparts, the comma is allowed to represent vowel glides or some non-Lojbanic sound. Such an exception affects only spelling accuracy and the ability of a reader to replicate the desired pronunciation exactly; it will not affect the recognition of word boundaries.

Still, it is better if Lojbanized names are always distinct. Therefore, the apostrophe is preferred in regular Lojbanized names that are not attempting to simulate a non-Lojban pronunciation perfectly. (Perfection, in any event, is not really achievable, because some sounds simply lack reasonable Lojbanic counterparts.)

If apostrophes were used instead of commas in Example 3.3.2, it would appear as:

**Example 3.3.4**

.i' ai' i' ai' on.  
/ʔi hai hi hai honʔ/

which preserves the rhythm and length, if not the exact sounds, of the original English.

### 3.4 Diphthongs and Syllabic Consonants

There exist 16 diphthongs in the Lojban language. A diphthong is a vowel sound that consists of two elements, a short vowel sound and a glide, either a labial (IPA /w/) or palatal (IPA /j/) glide, that either precedes (an on-glide) or follows (an off-glide) the main vowel. Diphthongs always constitute a single syllable.

For Lojban purposes, a vowel sound is a relatively long speech-sound that forms the nucleus of a syllable. Consonant sounds are relatively brief and normally require an accompanying vowel sound in order to be audible. Consonants may occur at the beginning or end of a syllable, around the vowel, and there may be several consonants in a cluster in either position. Each separate vowel sound constitutes a distinct syllable; consonant sounds do not affect the determination of syllables.

The six Lojban vowels are *a*, *e*, *i*, *o*, *u*, and *y*. The first five vowels appear freely in all kinds of Lojban words. The vowel *y* has a limited distribution: it appears only in Lojbanized names, in the Lojban names of the letters of the alphabet, as a glue vowel in compound words, and standing alone as a space-filler word (like English *uh* or *r*).

The Lojban diphthongs are shown in the table below. (Variant pronunciations have been omitted, but are much as one would expect based on the variant pronunciations of the separate vowel letters: *ai* may be pronounced /aj/, for example.)

**Definition 3.3**

<i>ai</i>	/aj/	an open vowel with palatal off-glide
<i>ei</i>	/ɛj/	a front mid vowel with palatal off-glide
<i>oi</i>	/oj/	a back mid vowel with palatal off-glide
<i>au</i>	/aw/	an open vowel with labial off-glide
<i>ia</i>	/ja/	an open vowel with palatal on-glide
<i>ie</i>	/jɛ/	a front mid vowel with palatal on-glide
<i>ii</i>	/ji/	a front close vowel with palatal on-glide
<i>io</i>	/jo/	a back mid vowel with palatal on-glide
<i>iu</i>	/ju/	a back close vowel with palatal on-glide
<i>ua</i>	/wa/	an open vowel with labial on-glide
<i>ue</i>	/wɛ/	a front mid vowel with labial on-glide
<i>ui</i>	/wi/	a front close vowel with labial on-glide
<i>uo</i>	/wo/	a back mid vowel with labial on-glide
<i>uu</i>	/wu/	a back close vowel with labial on-glide
<i>iy</i>	/jə/	a central mid vowel with palatal on-glide
<i>uy</i>	/wə/	a central mid vowel with labial on-glide

(Approximate English equivalents of most of these diphthongs exist: see Section 3.11 for examples.) The first four diphthongs above (*ai*, *ei*, *oi*, and *au*, the ones with off-glides) are freely used in most types of Lojban words; the ten following ones are used only as stand-alone words and in Lojbanized names and borrowings; and the last two (*iy* and *uy*) are used only in Lojbanized names.

The syllabic consonants of Lojban, /l/, /m/, /n/, and /r/, are variants of the non-syllabic /l/, /m/, /n/, and /r/ respectively. They normally have only a limited distribution, appearing in Lojban names and borrowings, although in principle any *l*, *m*, *n*, or *r* may be pronounced syllabically. If a syllabic consonant appears next to a *l*, *m*, *n*, or *r* that is not syllabic, it may not be clear which is which:

**Example 3.4.1**

brlgan.  
/br̩l̩ gan/  
or /br̩l̩ gan/

is a hypothetical Lojbanized name with more than one valid pronunciation; however it is pronounced, it remains the same word. Syllabic consonants are treated as consonants rather than vowels from the standpoint of Lojban morphology. Thus Lojbanized names, which are generally required to end in a consonant, are allowed to end with a syllabic consonant. An example is “rl.”, which is an approximation of the English name “Earl”, and has two syllabic consonants.

Syllables with syllabic consonants and no vowel are never stressed or counted when determining which syllables to stress (see Section 3.9).

## 3.5 Vowel Pairs

Lojban vowels also occur in pairs, where each vowel sound is in a separate syllable. These two vowel sounds are connected (and separated) by an apostrophe. Lojban vowel pairs should be pronounced continuously with the /h/ sound between (and not by a glottal stop or pause, which would split the two vowels into separate words).

All vowel combinations are permitted in two-syllable pairs with the apostrophe separating them; this includes those which constitute diphthongs when the apostrophe is not included.

The Lojban vowel pairs are:

a'a	a'e	a'i	a'o	a'u	a'y
e'a	e'e	e'i	e'o	e'u	e'y
i'a	i'e	i'i	i'o	i'u	i'y
o'a	o'e	o'i	o'o	o'u	o'y
u'a	u'e	u'i	u'o	u'u	u'y
y'a	y'e	y'i	y'o	y'u	y'y

Vowel pairs involving *y* appear only in Lojbanized names. They could appear in cmavo (structure words), but only *.y'y.* is so used — it is the Lojban name of the apostrophe letter (see Chapter 17).

When more than two vowels occur together in Lojban, the normal pronunciation pairs vowels from the left into syllables, as in the Lojbanized name:

**Example 3.5.1**

meiin.  
mei,in.

Example 3.5.1 contains the diphthong *ei* followed by the vowel *i*. In order to indicate a different grouping, the comma must always be used, leading to:

**Example 3.5.2**

me,iin.

which contains the vowel *e* followed by the diphthong *ii*. In rough English representation, Example 3.5.1 is “May Een”, whereas Example 3.5.2 is “Meh Yeen”.

## 3.6 Consonant Clusters

A consonant sound is a relatively brief speech-sound that precedes or follows a vowel sound in a syllable; its presence either preceding or following does not add to the count of syllables, nor is a consonant required in either position for any syllable. Lojban has seventeen consonants: for the purposes of this section, the apostrophe is not counted as a consonant.

An important distinction dividing Lojban consonants is that of voicing. The following table shows the unvoiced consonants and the corresponding voiced ones:

Unvoiced	Voiced
p	b
t	d
k	g
f	v
c	j
s	z
x	

The consonant *x* has no voiced counterpart in Lojban. The remaining consonants, *l*, *m*, *n*, and *r*, are typically pronounced with voice, but can be pronounced unvoiced.

Consonant sounds occur in languages as single consonants, or as doubled, or as clustered combinations. Single consonant sounds are isolated by word boundaries or by intervening vowel sounds from other consonant sounds. Doubled consonant sounds are either lengthened like /s/ in English “hiss”, or repeated like /k/ in English “backcourt”. Consonant clusters consist of two or more single or doubled consonant sounds in a group, each of which is different from its immediate neighbor. In Lojban, doubled consonants are excluded altogether, and clusters are limited to two or three members, except in Lojbanized names.

Consonants can occur in three positions in words: initial (at the beginning), medial (in the middle), and final (at the end). In many languages, the sound of a consonant varies depending upon its position in the word. In Lojban, as much as possible, the sound of a consonant is unrelated to its position. In particular, the common American English trait of changing a *t* between vowels into a *d* or even a flap (IPA /ɾ/) is unacceptable in Lojban.

Lojban imposes no restrictions on the appearance of single consonants in any valid consonant position; however, no consonant (including syllabic consonants) occurs final in a word except in Lojbanized names.

Pairs of consonants can also appear freely, with the following restrictions:

1. It is forbidden for both consonants to be the same, as this would violate the rule against double consonants.
2. It is forbidden for one consonant to be voiced and the other unvoiced. The consonants *l*, *m*, *n*, and *r* are exempt from this restriction. As a result, *bf* is forbidden, and so is *sd*, but both *fl* and *vl*, and both *ls* and *lz*, are permitted.
3. It is forbidden for both consonants to be drawn from the set *c*, *j*, *s*, *z*.
4. The specific pairs *cx*, *kx*, *xc*, *xk*, and *mz* are forbidden.

These rules apply to all kinds of words, even Lojbanized names. If a name would normally contain a forbidden consonant pair, a *y* can be inserted to break up the pair:

**Example 3.6.1**  
 djeimyz.  
 /dʒɛj mɛzʔ/  
 James

The regular English pronunciation of “James”, which is /dʒɛjmz/, would Lojbanize as “djeimz.”, which contains a forbidden consonant pair.

## 3.7 Initial Consonant Pairs

The set of consonant pairs that may appear at the beginning of a word (excluding Lojbanized names) is far more restricted than the fairly large group of permissible consonant pairs described in Section 3.6. Even so, it is more than English allows, although hopefully not more than English-speakers (and others) can learn to pronounce.

There are just 48 such permissible initial consonant pairs: *bl*, *br*, *cf*, *ck*, *cl*, *cm*, *cn*, *cp*, *cr*, *ct*, *dj*, *dr*, *dz*, *fl*, *fr*, *gl*, *gr*, *jb*, *jd*, *jk*, *jm*, *ju*, *kl*, *kr*, *ml*, *mr*, *pl*, *pr*, *sf*, *sk*, *sl*, *sm*, *sn*, *sp*, *sr*, *st*, *tc*, *tr*, *ts*, *vl*, *vr*, *xl*, *xr*, *zb*, *zd*, *zg*, *zm* and *zv*.

pl	pr				fl	fr	
bl	br				vl	vr	
cp	cf	ct	ck	cm	cn	cl	cr
jb	jv	jd	jg	jm			
sp	sf	st	sk	sm	sn	sl	sr
zb	zv	zd	zg	zm			
tc	tr	ts			kl	kr	
dj	dr	dz			gl	gr	
ml	mr				xl	xr	

Lest this list seem almost random, a pairing of voiced and unvoiced equivalent vowels will show significant patterns which may help in learning:

Note that if both consonants of an initial pair are voiced, the unvoiced equivalent is also permissible, and the voiced pair can be pronounced simply by voicing the unvoiced pair. (The converse is not true: *cn* is a permissible initial pair, but *jn* is not.) Consonant triples can occur medially in Lojban words. They are subject to the following rules:

1. The first two consonants must constitute a permissible consonant pair;
2. The last two consonants must constitute a permissible initial consonant pair;
3. The triples *ndj*, *ndz*, *ntc*, and *nts* are forbidden.

Lojbanized names can begin or end with any permissible consonant pair, not just the 48 initial consonant pairs listed above, and can have consonant triples in any location, as long as the pairs making up those triples are permissible. In addition, names can contain consonant clusters with more than three consonants, again requiring that each pair within the cluster is valid.

### 3.8 Buffering Of Consonant Clusters

Many languages do not have consonant clusters at all, and even those languages that do have them often allow only a subset of the full Lojban set. As a result, the Lojban design allows the use of a buffer sound between consonant combinations which a speaker finds unpronounceable. This sound may be any non-Lojbanic vowel which is clearly separable by the listener from the Lojban vowels. Some possibilities are IPA /I/, /ö/, /U/, or even /Y/, but there probably is no universally acceptable buffer sound. When using a consonant buffer, the sound should be made as short as possible. Two examples showing such buffering (we will use /I/ in this chapter) are:

#### Example 3.8.1

```
vrusi
/'vru si/
or /vI 'ru si/
```

**Example 3.8.2**

.AMsterdam.  
 /ʔam ster damʔ/  
 or /'ʔa mI sI tɛ rI da mIʔ/

When a buffer vowel is used, it splits each buffered consonant into its own syllable. However, the buffering syllables are never stressed, and are not counted in determining stress. They are, in effect, not really syllables to a Lojban listener, and thus their impact is ignored.

Here are more examples of unbuffered and buffered pronunciations:

**Example 3.8.3**

klama  
 /'kla ma/  
 /kI 'la ma/

**Example 3.8.4**

xapcke  
 /'xap cke/  
 /'xa pI cke/  
 /'xa pI cI ke/

In Example 3.8.4, we see that buffering vowels can be used in just some, rather than all, of the possible places: the second pronunciation buffers the *pc* consonant pair but not the *ck*. The third pronunciation buffers both.

**Example 3.8.5**

ponyni'u  
 /po nə 'ni hu/

Example 3.8.5 cannot contain any buffering vowel. It is important not to confuse the vowel *y*, which is pronounced /ə/, with the buffer, which has a variety of possible pronunciations and is never written. Consider the contrast between

**Example 3.8.6**

bongynanba  
 /boŋ gə 'nan ba/

an unlikely Lojban compound word meaning “bone bread” (note the use of /ŋ/ as a representative of *n* before *g*) and

**Example 3.8.7**

bongnanba  
 /boŋ 'gnan ba/

a possible borrowing from another language (Lojban borrowings can only take a limited form). If Example 3.8.7 were pronounced with buffering, as



**Example 3.8.8**

/boŋ gI 'nan ba/

it would be very similar to Example 3.8.6. Only a clear distinction between *y* and any buffering vowel would keep the two words distinct.

Since buffering is done for the benefit of the speaker in order to aid pronounceability, there is no guarantee that the listener will not mistake a buffer vowel for one of the six regular Lojban vowels. The buffer vowel should be as laxly pronounced as possible, as central as possible, and as short as possible. Furthermore, it is worthwhile for speakers who use buffers to pronounce their regular vowels a bit longer than usual, to avoid confusion with buffer vowels. The speakers of many languages will have trouble correctly hearing any of the suggested buffer vowels otherwise. By this guideline, Example 3.8.8 would be pronounced

**Example 3.8.9**

/bo:ŋ gI 'na:n ba:/

with lengthened vowels.

### 3.9 Syllabication And Stress

A Lojban word has one syllable for each of its vowels, diphthongs, and syllabic consonants (referred to simply as “vowels” for the purposes of this section.) Syllabication rules determine which of the consonants separating two vowels belong to the preceding vowel and which to the following vowel. These rules are conventional only; the phonetic facts of the matter about how utterances are syllabified in any language are always very complex.

A single consonant always belongs to the following vowel. A consonant pair is normally divided between the two vowels; however, if the pair constitute a valid initial consonant pair, they are normally both assigned to the following vowel. A consonant triple is divided between the first and second consonants. Apostrophes and commas, of course, also represent syllable breaks. Syllabic consonants usually appear alone in their syllables.

It is permissible to vary from these rules in Lojbanized names. For example, there are no definitive rules for the syllabication of names with consonant clusters longer than three consonants. The comma is used to indicate variant syllabication or to explicitly mark normal syllabication.

Here are some examples of Lojban syllabication:

**Example 3.9.1**

pujenaicajeba  
pu,je,nai,ca,je,ba

This word has no consonant pairs and is therefore syllabified before each medial consonant.

**Example 3.9.2**

ninmu  
nin,mu

This word is split at a consonant pair.

**Example 3.9.3**

fitpri  
fit,pri

This word is split at a consonant triple, between the first two consonants of the triple.

**Example 3.9.4**

sairgoi  
sair,goi  
sai,r,goi

This word contains the consonant pair *rg*; the *r* may be pronounced syllabically or not.

**Example 3.9.5**

klezba  
klez,ba  
kle,zba

This word contains the permissible initial pair *zb*, and so may be syllabicated either between *z* and *b* or before *zb*.

Stress is a relatively louder pronunciation of one syllable in a word or group of words. Since every syllable has a vowel sound (or diphthong or syllabic consonant) as its nucleus, and the stress is on the vowel sound itself, the terms “stressed syllable” and “stressed vowel” are largely interchangeable concepts.

Most Lojban words are stressed on the next-to-the-last, or penultimate, syllable. In counting syllables, however, syllables whose vowel is *y* or which contain a syllabic consonant (*l*, *m*, *n*, or *r*) are never counted. (The Lojban term for penultimate stress is “da’amoī terbasna”.) Similarly, syllables created solely by adding a buffer vowel, such as /I/, are not counted.

There are actually three levels of stress — primary, secondary, and weak. Weak stress is the lowest level, so it really means no stress at all. Weak stress is required for syllables containing *y*, a syllabic consonant, or a buffer vowel.

Primary stress is required on the penultimate syllable of Lojban content words (called “brivla”). Lojbanized names may be stressed on any syllable, but if a syllable other than the penultimate is stressed, the syllable (or at least its vowel) must be capitalized in writing. Lojban structural words (called “cmavo”) may be stressed on any syllable or none at all. However, primary stress may not be used in a syllable just preceding a brivla, unless a pause divides them; otherwise, the two words may run together.

Secondary stress is the optional and non-distinctive emphasis used for other syllables besides those required to have either weak or primary stress. There are few rules governing secondary stress, which typically will follow a speaker’s native language habits or preferences. Secondary stress can be used for contrast, or for emphasis of a point. Secondary stress can be emphasized at any level up to primary stress, although the speaker must not allow a false primary stress in brivla, since errors in word resolution could result.

The following are Lojban words with stress explicitly shown:

**Example 3.9.6**

dikyjvo  
DI,ky,jvo

(In a fully-buffered dialect, the pronunciation would be: /'di kə jI vo/.) Note that the syllable *ky* is not counted in determining stress. The vowel *y* is never stressed in a normal Lojban context.

**Example 3.9.7**

.armstrong.  
.ARM,strong.

This is a Lojbanized version of the name “Armstrong”. The final *g* must be explicitly pronounced. With full buffering, the name would be pronounced:

**Example 3.9.8**

/'ʔa rI mI sI tI ro nI gIʔ/

However, there is no need to insert a buffer in every possible place just because it is inserted in one place: partial buffering is also acceptable. In every case, however, the stress remains in the same place: on the first syllable.

The English pronunciation of “Armstrong”, as spelled in English, is not correct by Lojban standards; the letters *ng* in English represent a velar nasal (IPA /ŋ/) which is a single consonant. In Lojban, *ng* represents two separate consonants that must both be pronounced; you may not use /ŋ/ to pronounce Lojban *ng*, although /ŋg/ is acceptable. English speakers are likely to have to pronounce the ending with a buffer, as one of the following:

**Example 3.9.9**

/'ʔarm stron gIʔ/  
or /'ʔarm stroŋ gIʔ/  
or even /'ʔarm stro nIʔgʔ/

The normal English pronunciation of the name “Armstrong” could be Lojbanized as:

**Example 3.9.10**

.ARMstron.

since Lojban *n* is allowed to be pronounced as the velar nasal /ŋ/. Here is another example showing the use of *y*:

**Example 3.9.11**

bisydja  
BI,sy,dja  
BI,syd,ja

This word is a compound word, or *lujvo*, built from the two affixes *bis* and *dja*. When they are joined, an impermissible consonant pair results: *sd*. In accordance with the algorithm for making *lujvo*, explained in Chapter 4, a *y* is inserted to separate the impermissible consonant pair; the *y* is not counted as a syllable for purposes of stress determination.

**Example 3.9.12**

da'udja  
da'UD,ja  
da'U,dja

These two syllabifications sound the same to a Lojban listener — the association of unbuffered consonants in syllables is of no import in recognizing the word.

**Example 3.9.13**

e'u brid  
 e'u BRI,di  
 E'u BRI,di  
 e'U.BRI,di

In Example 3.9.13, *e'u* is a cmavo and “bridi” is a brivla. Either of the first two pronunciations is permitted: no primary stress on either syllable of *e'u*, or primary stress on the first syllable. The third pronunciation, which places primary stress on the second syllable of the cmavo, requires that — since the following word is a brivla — the two words must be separated by a pause. Consider the following two cases:

**Example 3.9.14**

le re nobli prenu  
 le re NObli PREnu

**Example 3.9.15**

le re no bliprenu  
 le re no bliPREnu

If the cmavo *no* in Example 3.9.15 were to be stressed, the phrase would sound exactly like the given pronunciation of Example 3.9.14, which is unacceptable in Lojban: a single pronunciation cannot represent both.

## 3.10 IPA For English Speakers

There are many dialects of English, thus making it difficult to define the standardized symbols of the IPA in terms useful to every reader. All the symbols used in this chapter are repeated here, in more or less alphabetical order, with examples drawn from General American. In addition, some attention is given to the Received Pronunciation of (British) English. These two dialects are referred to as GA and RP respectively. Speakers of other dialects should consult a book on phonetics or their local television sets.

**Definition 3.4**

/	An IPA indicator of primary stress; the syllable which follows / / receives primary stress.
/ʔ/	An allowed variant of Lojban .. This sound is not usually considered part of English. It is the catch in your throat that sometimes occurs prior to the beginning of a word (and sometimes a syllable) which starts with a vowel. In some dialects, like Cockney and some kinds of American English, it is used between vowels instead of <i>t</i> : “bottle” /boʔl/. The English interjection “uh-oh!” almost always has it between the syllables.
:/	A symbol indicating that the previous vowel is to be spoken for a longer time than usual. Lojban vowels can be pronounced long in order to make a greater contrast with buffer vowels.

/a/	The preferred pronunciation of Lojban <i>a</i> . This sound doesn't occur in GA, but sounds somewhat like the <i>ar</i> of "park", as spoken in RP or New England American. It is pronounced further forward in the mouth than /a/.
/ɑ/	An allowed variant of Lojban <i>a</i> . The <i>a</i> of GA "father". The sound /ɑ/ is preferred because GA speakers often relax an unstressed /a/ into a schwa /ə/, as in the usual pronunciations of "about" and "sofa". Because schwa is a distinct vowel in Lojban, English speakers must either learn to avoid this shift or to use /ɑ/ instead: the Lojban word for "sofa" is "sfofa", pronounced /sfɔfɑ/ or /sfɔfɑ/ but never /sfɔfə/ which would be the non-word "sfofy".
/æ/	Not a Lojban sound. The <i>a</i> of English "cat".
/b/	The preferred pronunciation of Lojban <i>b</i> . As in English "boy", "sober", or "job".
/β/	An allowed variant of Lojban <i>v</i> . Not an English sound; the Spanish <i>b</i> or <i>v</i> between vowels. This sound should not be used for Lojban <i>b</i> .
/d/	The preferred pronunciation of Lojban <i>d</i> . As in English "dog", "soda", or "mad".
/ɛ/	The preferred pronunciation of Lojban <i>e</i> . The <i>e</i> of English "met".
/e/	An allowed variant of Lojban <i>e</i> . This sound is not found in English, but is the Spanish <i>e</i> , or the tense <i>e</i> of Italian. The vowel of English "say" is similar except for the off-glide: you can learn to make this sound by holding your tongue steady while saying the first part of the English vowel.
/ə/	The preferred pronunciation of Lojban <i>y</i> . As in the <i>a</i> of English "sofa" or "about". Schwa is generally unstressed in Lojban, as it is in English. It is a totally relaxed sound made with the tongue in the middle of the mouth.
/f/	The preferred pronunciation of Lojban <i>f</i> . As in "fee", "loafer", or "chef".
/ɸ/	An allowed variant of Lojban <i>f</i> . Not an English sound; the Japanese <i>f</i> sound.
/g/	The preferred pronunciation of Lojban <i>g</i> . As in English "go", "eagle", or "dog".
/h/	The preferred pronunciation of the Lojban apostrophe sound. As in English "aha" or "oh, hello".
/i/	The preferred pronunciation of Lojban <i>i</i> . Essentially like the English vowel of "pizza" or "machine", although the English vowel is sometimes pronounced with an off-glide, which should not be present in Lojban.
/I/	A possible Lojban buffer vowel. The <i>i</i> of English "bit".
/ö/	A possible Lojban buffer vowel. The <i>u</i> of "just" in some varieties of GA, those which make the word sound more or less like "jist". Also Russian <i>y</i> as in "byt' " (to be); like a schwa /ə/, but higher in the mouth.
/j/	Used in Lojban diphthongs beginning or ending with <i>i</i> . Like the <i>y</i> in English "yard" or "say".
/k/	The preferred pronunciation of Lojban <i>k</i> . As in English "kill", "token", or "flak".
/l/	The preferred pronunciation of Lojban <i>l</i> . As in English "low", "nylon", or "excel".
/l̥/	The syllabic version of Lojban <i>l</i> , as in English "bottle" or "middle".
/m/	The preferred pronunciation of Lojban <i>m</i> . As in English "me", "humor", or "ham".
/m̥/	The syllabic version of Lojban <i>m</i> . As in English "catch 'em" or "bottom".
/n/	The preferred pronunciation of Lojban <i>n</i> . As in English "no", "honor", or "son".
/n̥/	The syllabic version of Lojban <i>n</i> . As in English "button".
/ŋ/	An allowed variant of Lojban <i>n</i> , especially in Lojbanized names and before <i>g</i> or <i>k</i> . As in English "sing" or "singer" (but not "finger" or "danger").
/ŋ̥/	An allowed variant of Lojban syllabic <i>n</i> , especially in Lojbanized names.

/o/	The preferred pronunciation of Lojban <i>o</i> . As in the French “haute (cuisine)” or Spanish “como”. There is no exact English equivalent of this sound. The nearest GA equivalent is the <i>o</i> of “dough” or “joke”, but it is essential that the off-glide (a /w/-like sound) at the end of the vowel is not pronounced when speaking Lojban. The RP sound in these words is /əw/ in IPA terms, and has no /o/ in it at all; unless you can speak with a Scots, Irish, or American accent, you may have trouble with this sound.
/ɔ/	An allowed variant of Lojban <i>o</i> , especially before <i>r</i> . This sound is a shortened form of the “aw” in GA “dawn” (for those people who don’t pronounce “dawn” and “Don” alike; if you do, you may have trouble with this sound). In RP, but not GA, it is the <i>o</i> of “hot”.
/p/	The preferred pronunciation of Lojban <i>p</i> . As in English “pay”, “super”, or “up”.
/r/	One version of Lojban <i>r</i> . Not an English sound. The Spanish <i>rr</i> and the Scots <i>r</i> , a tongue-tip trill.
/ɹ/	One version of Lojban <i>r</i> . As in GA “right”, “baron”, or “car”. Not found in RP.
/ɻ/	One version of Lojban <i>r</i> . In GA, appears as a variant of <i>t</i> or <i>d</i> in the words “metal” and “medal” respectively. A tongue-tip flap. /R/ One version of Lojban <i>r</i> . Not an English sound. The French or German <i>r</i> in “reine” or “rot” respectively. A uvular trill. /ɽ/, /ɹ̥/, /ɹ̥̥/, /R̥/ are syllabic versions of the above. /ɹ̥/ appears in the GA (but not RP) pronunciation of “bird”.
/s/	The preferred pronunciation of Lojban <i>s</i> . As in English “so”, “basin”, or “yes”.
/ʃ/	The preferred pronunciation of Lojban <i>c</i> . The “sh” of English “ship”, “ashen”, or “dish”.
/ṣ/	An allowed variant of Lojban <i>s</i> . Not an English sound. The Hindi retroflex <i>s</i> with underdot, or Klingon <i>S</i> .
/t/	The preferred pronunciation of Lojban <i>t</i> . As in English “tea”, “later”, or “not”. It is important to avoid the GA habit of pronouncing the <i>t</i> between vowels as /d/ or /ɾ/.
/T/	Not normally a Lojban sound, but a possible variant of Lojban <i>ʔ</i> . The <i>th</i> of English “thin” (but not “then”).
/v/	The preferred pronunciation of Lojban <i>v</i> . As in English “voice”, “savor”, or “live”.
/w/	Used in Lojban diphthongs beginning or ending with <i>u</i> . Like the <i>w</i> in English “wet” /wɛt/ or “cow” /kaw/.
/x/	The preferred pronunciation of Lojban <i>x</i> . Not normally an English sound, but used in some pronunciations of “loch” and “Bach”; <i>gh</i> in Scots “might” and “night”. The German “Ach-Laut”. To pronounce /x/, force air through your throat without vibrating your vocal chords; there should be lots of scrape.
/Y/	A possible Lojban buffer vowel. Not an English sound: the <i>ü</i> of German “hübsch”.
/z/	The preferred pronunciation of Lojban <i>z</i> . As in English “zoo”, “hazard”, or “fizz”.
/ʒ/	The preferred pronunciation of Lojban <i>j</i> . The <i>si</i> of English “vision”, or the consonant at the end of GA “garage”.
/z̥/	An allowed variant of Lojban <i>z</i> . Not an English sound. The voiced version of /s̥/.

### 3.11 English Analogues For Lojban Diphthongs

Here is a list of English words that contain diphthongs that are similar to the Lojban diphthongs. This list does not constitute an official pronunciation guide; it is intended as a help to English-speakers.

#### Definition 3.5

<i>ai</i>	pie
<i>ei</i>	pay
<i>oi</i>	boy
<i>au</i>	cow
<i>ia</i>	yard
<i>ie</i>	yes
<i>ii</i>	ye
<i>io</i>	yodel (in GA only)
<i>iu</i>	unicorn, few
<i>ua</i>	suave
<i>ue</i>	wet
<i>ui</i>	we
<i>uo</i>	woe (in GA only)
<i>uu</i>	woo
<i>iy</i>	million (the <i>io</i> part, that is)
<i>uy</i>	was (when unstressed)

### 3.12 Oddball Orthographies

The following notes describe ways in which Lojban has been written or could be written that differ from the standard orthography explained in the rest of this chapter. Nobody needs to read this section except people with an interest in the obscure. Technicalities are used without explanation or further apology.

There exists an alternative orthography for Lojban, which is designed to be as compatible as possible (but no more so) with the authority used in pre-Lojban versions of Loglan. The consonants undergo no change, except that “x” is replaced by “h”. The individual vowels likewise remain unchanged. However, the vowel pairs and diphthongs are changed as follows:

- *ai, ei, oi, au* become *ai, ei, oi, ao*.
- *ia* through *iu* and *ua* through *uu* remain unchanged.
- *a'i, e'i, o'i* and *a'o* become *a,i, e,i, o,i* and *a,o*.
- *i'a* through *i'u* and *u'a* through *u'u* are changed to *ia* through *iu* and *ua* through *uu* in *lujvo* and *cmavo* other than *attitudinals*, but become *i,a* through *i,u* and *u,a* through *u,u* in names, *fu'ivla*, and *attitudinal cmavo*.
- All other vowel pairs simply drop the apostrophe.

The result of these rules is to eliminate the apostrophe altogether, replacing it with comma where necessary, and otherwise with nothing. In addition, names and the cmavo *.i* are capitalized, and irregular stress is marked with an apostrophe (now no longer used for a sound) following the stressed syllable.

Three points must be emphasized about this alternative orthography:

- It is not standard, and has not been used.
- It does not represent any changes to the standard Lojban phonology; it is simply a representation of the same phonology using a different written form.
- It was designed to aid in a planned rapprochement between the Logical Language Group and The Loglan Institute, a group headed by James Cooke Brown. The rapprochement never took place.

There also exists a Cyrillic orthography for Lojban which was designed when the introductory Lojban brochure was translated into Russian. It uses the letters *a, be, ve, ge, de, e, zhe, ze, i, ka, el, em, en, o, pe, er, es, te, u, ef, kha*, and *sha* in the obvious ways. The Latin letter *y* is mapped onto the hard sign, as in Bulgarian. The apostrophe, comma, and period are unchanged. Diphthongs are written as vowel pairs, as in the Roman representation.

Finally, an orthography using the Tengwar of Féanor, a fictional orthography invented by J. R. R. Tolkien and described in the Appendixes to *The Lord Of The Rings*, has been devised for Lojban. The following mapping, which closely resembles that used for Westron, will be meaningful only to those who have read those appendixes. In brief, the tincotéma and parmatéma are used in the conventional ways; the calmatéma represents palatal consonants, and the quessetéma represents velar consonants.

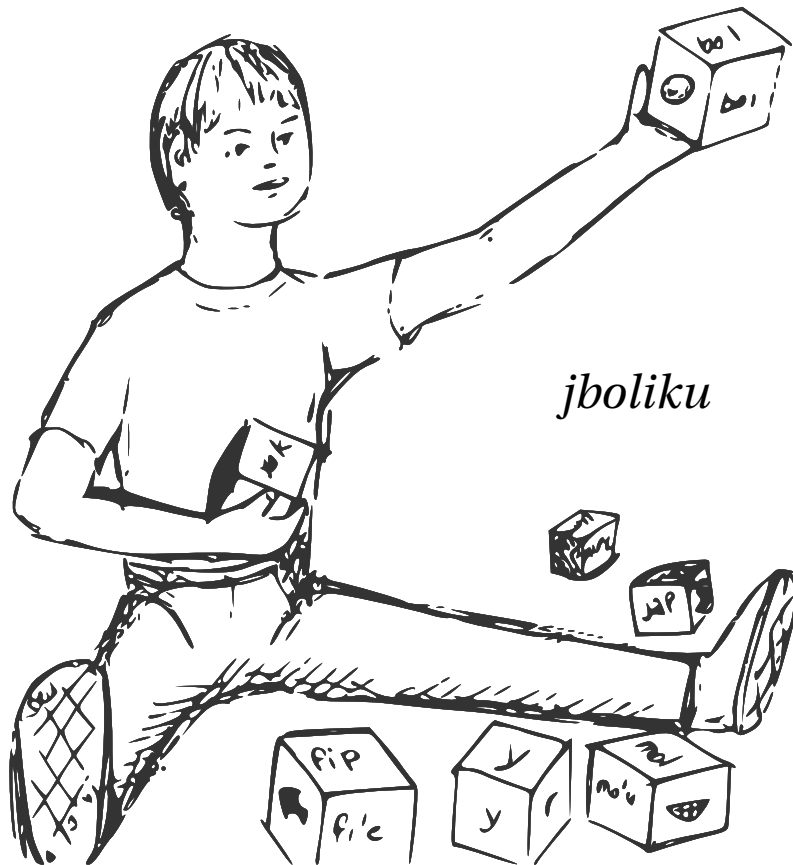
t	tinco	p	parma
–	calma	k	quesse
d	ando	b	umbar
–	anga	g	ungwe
–	thule	f	formen
c	harma	x	hwesta
–	anto	v	ampa
j	anca	–	unque
n	numen	m	malta
–	noldo	–	nwalme
r	ore	u	vala
i	anna	–	vilya

The letters *vala* and *anna* are used for *u* and *i* only when those letters are used to represent glides. Of the additional letters, *r, l, s*, and *z* are written with *rómen, lambe, silme*, and *áre/esse* respectively; the inverted forms are used as free variants.

Lojban, like Quenya, is a vowel-last language, so tehtar are read as following the tengwar on which they are placed. The conventional tehtar are used for the five regular vowels, and the under-dot for *y*. The Lojban apostrophe is represented by *halla*. There is no equivalent of the Lojban comma or period.



# The Shape of Words to Come: Lojban Morphology



## 4.1 Introduction

Morphology is the part of grammar that deals with the form of words. Lojban's morphology is fairly simple compared to that of many languages, because Lojban words don't change form

depending on how they are used. English has only a small number of such changes compared to languages like Russian, but we do have changes like “boys” as the plural of “boy”, or “walked” as the past-tense form of “walk”. To make plurals or past tenses in Lojban, you add separate words to the sentence that express the number of boys, or the time when the walking was going on.

However, Lojban does have what is called *derivational morphology*: the capability of building new words from old words. In addition, the form of words tells us something about their grammatical uses, and sometimes about the means by which they entered the language. Lojban has very orderly rules for the formation of words of various types, both the words that already exist and new words yet to be created by speakers and writers.

A stream of Lojban sounds can be uniquely broken up into its component words according to specific rules. These so-called “morphology rules” are summarized in this chapter. (However, a detailed algorithm for breaking sounds into words has not yet been fully debugged, and so is not presented in this book.) First, here are some conventions used to talk about groups of Lojban letters, including vowels and consonants.

1. V represents any single Lojban vowel except *y*; that is, it represents *a, e, i, o, u*.
2. VV represents either a diphthong: (*ai, ei, oi* or *au*) or a two-syllable vowel pair with an apostrophe separating the vowels: *a'a, a'e, a'i, a'o, a'u, e'a, e'e, e'i, e'o, e'u, i'a, i'e, i'i, i'o, i'u, o'a, o'e, o'i, o'o, o'u, u'a, u'e, u'i, u'o* or *u'u*.
3. C represents a single Lojban consonant, not including the apostrophe, one of *b, c, d, f, g, j, k, l, m, n, p, r, s, t, v, x, z*. Syllabic *l, m, n*, and *r* always count as consonants for the purposes of this chapter.
4. CC represents two adjacent consonants of type C which constitute one of the 48 permissible initial consonant pairs: *bl, br, cf, ck, cl, cm, cn, cp, cr, ct, dj, dr, dz, fl, fr, gl, gr, jb, jd, jg, jm, jv, kl, kr, ml, mr, pl, pr, sf, sk, sl, sm, sn, sp, sr, st, tc, tr, ts, vl, vr, xl, xr, zb, zd, zg, zm* or *zv*.
5. C/C represents two adjacent consonants which constitute one of the permissible consonant pairs (not necessarily a permissible initial consonant pair). The permissible consonant pairs are explained in Chapter 3. In brief, any consonant pair is permissible unless it contains: two identical letters, both a voiced (excluding *r, l, m, n*) and an unvoiced consonant, or is one of certain specified forbidden pairs.
6. C/CC represents a consonant triple. The first two consonants must constitute a permissible consonant pair; the last two consonants must constitute a permissible initial consonant pair.

Lojban has three basic word classes — parts of speech — in contrast to the eight that are traditional in English. These three classes are called *cmavo*, *brivla*, and *cmene*. Each of these classes has uniquely identifying properties — an arrangement of letters that allows the word to be uniquely and unambiguously recognized as a separate word in a string of Lojban, upon either reading or hearing, and as belonging to a specific word-class.

They are also functionally different: *cmavo* are the structure words, corresponding to English words like “and”, “if”, “the” and “to”; *brivla* are the content words, corresponding to English words like “come”, “red”, “doctor”, and “freely”; *cmene* are proper names, corresponding to English “James”, “Afghanistan”, and “Pope John Paul II”.

## 4.2 cmavo

The first group of Lojban words discussed in this chapter are the cmavo. They are the structure words that hold the Lojban language together. They often have no semantic meaning in themselves, though they may affect the semantics of brivla to which they are attached. The cmavo include the equivalent of English articles, conjunctions, prepositions, numbers, and punctuation marks. There are over a hundred subcategories of cmavo, known as “selma’o”, each having a specifically defined grammatical usage. The various selma’o are discussed throughout Chapter 5 to Chapter 19 and summarized in Chapter 20.

Standard cmavo occur in four forms defined by their word structure. Here are some examples of the various forms:

V-form	.a	.e	.i	.o	.u
CV-form	ba	ce	di	fo	gu
VV-form	.au	.ei	.ia	.o’u	.u’e
CVV-form	ki’a	pei	mi’o	coi	cu’u

In addition, there is the cmavo “.y.” (remember that *y* is not a V), which must have pauses before and after it.

A simple cmavo thus has the property of having only one or two vowels, or of having a single consonant followed by one or two vowels. Words consisting of three or more vowels in a row, or a single consonant followed by three or more vowels, are also of cmavo form, but are reserved for experimental use: a few examples are “ku’a’e”, “sau’e”, and “bai’ai”. All CVV cmavo beginning with the letter *x* are also reserved for experimental use. In general, though, the form of a cmavo tells you little or nothing about its grammatical use.

“Experimental use” means that the language designers will not assign any standard meaning or usage to these words, and words and usages coined by Lojban speakers will not appear in official dictionaries for the indefinite future. Experimental-use words provide an escape hatch for adding grammatical mechanisms (as opposed to semantic concepts) the need for which was not foreseen.

The cmavo of VV-form include not only the diphthongs and vowel pairs listed in Section 4.1, but also the following ten additional diphthongs:

.ia	.ie	.ii	.io	.iu
.ua	.ue	.ui	.uo	.uu

In addition, cmavo can have the form *Cy*, a consonant followed by the letter *y*. These cmavo represent letters of the Lojban alphabet, and are discussed in detail in Chapter 17.

Compound cmavo are sequences of cmavo attached together to form a single written word. A compound cmavo is always identical in meaning and in grammatical use to the separated sequence of simple cmavo from which it is composed. These words are written in compound form merely to save visual space, and to ease the reader’s burden in identifying when the component cmavo are acting together.

Compound cmavo, while not visually short like their components, can be readily identified by two characteristics:

1. They have no consonant pairs or clusters, and
2. They end in a vowel.

For example:

**Example 4.2.1**

.iseci'i  
.i se ci'i

**Example 4.2.2**

punaijecanai  
pu nai je ca nai

**Example 4.2.3**

ki'e.u'e  
ki'e .u'e

The cmavo “.u’e” begins with a vowel, and like all words beginning with a vowel, requires a pause (represented by .) before it. This pause cannot be omitted simply because the cmavo is incorporated into a compound cmavo. On the other hand,

**Example 4.2.4**

ki'e'u'e

is a single cmavo reserved for experimental purposes: it has four vowels.

**Example 4.2.5**

cy.ibu.abu  
cy. .ibu .abu

Again the pauses are required (see Section 4.9); the pause after “cy.” merges with the pause before “.ibu”.

There is no particular stress required in cmavo or their compounds. Some conventions do exist that are not mandatory. For two-syllable cmavo, for example, stress is typically placed on the first vowel; an example is

**Example 4.2.6**

.e'o ko ko kurji  
.E'o ko ko KURji

This convention results in a consistent rhythm to the language, since brivla are required to have penultimate stress; some find this esthetically pleasing.

If the final syllable of one word is stressed, and the first syllable of the next word is stressed, you must insert a pause or glottal stop between the two stressed syllables. Thus

**Example 4.2.7**

le re nanmu

can be optionally pronounced

**Example 4.2.8**

le RE. NANmu

since there are no rules forcing stress on either of the first two words; the stress on “re”, though, demands that a pause separate “re” from the following syllable “nan” to ensure that the stress on “nan” is properly heard as a stressed syllable. The alternative pronunciation

**Example 4.2.9**

LE re NANmu

is also valid; this would apply secondary stress (used for purposes of emphasis, contrast or sentence rhythm) to “le”, comparable in rhythmical effect to the English phrase “THE two men”. In Example 4.2.8, the secondary stress on “re” would be similar to that in the English phrase “the TWO men”. Both cmavo may also be left unstressed, thus:

**Example 4.2.10**

le re NANmu

This would probably be the most common usage.

### 4.3 brivla

Predicate words, called *brivla*, are at the core of Lojban. They carry most of the semantic information in the language. They serve as the equivalent of English nouns, verbs, adjectives, and adverbs, all in a single part of speech.

Every brivla belongs to one of three major subtypes. These subtypes are defined by the form, or morphology, of the word — all words of a particular structure can be assigned by sight or sound to a particular type (cmavo, brivla, or cmene) and subtype. Knowing the type and subtype then gives you, the reader or listener, significant clues to the meaning and the origin of the word, even if you have never heard the word before.

The same principle allows you, when speaking or writing, to invent new brivla for new concepts “on the fly”; yet it offers people that you are trying to communicate with a good chance to figure out your meaning. In this way, Lojban has a flexible vocabulary which can be expanded indefinitely.

All brivla have the following properties:

1. always end in a vowel;
2. always contain a consonant pair in the first five letters, where *y* and apostrophe are not counted as letters for this purpose. (See Section 4.6.)
3. always are stressed on the next-to-the-last (penultimate) syllable; this implies that they have two or more syllables.

The presence of a consonant pair distinguishes brivla from cmavo and their compounds. The final vowel distinguishes brivla from cmene, which always end in a consonant. Thus “da’amei” must be a compound cmavo because it lacks a consonant pair; “lojban.” must be a name because it lacks a final vowel.

Thus, “bisycla” has the consonant pair *sc* in the first five non-*y* letters even though the *sc* actually appears in the form of *syc*. Similarly, the word “ro’inre’o” contains *nr* in the first five letters because the apostrophes are not counted for this purpose.

The three subtypes of brivla are:

1. gismu, the Lojban primitive roots from which all other brivla are built;
2. lujvo, the compounds of two or more gismu; and
3. fu'ivla (literally “copy-word”), the specialized words that are not Lojban primitives or natural compounds, and are therefore borrowed from other languages.

## 4.4 gismu

The gismu, or Lojban root words, are those brivla representing concepts most basic to the language. The gismu were chosen for various reasons: some represent concepts that are very familiar and basic; some represent concepts that are frequently used in other languages; some were added because they would be helpful in constructing more complex words; some because they represent fundamental Lojban concepts (like *cmavo* and *gismu* themselves).

The gismu do not represent any sort of systematic partitioning of semantic space. Some gismu may be superfluous, or appear for historical reasons: the gismu list was being collected for almost 35 years and was only weeded out once. Instead, the intention is that the gismu blanket semantic space: they make it possible to talk about the entire range of human concerns.

There are about 1350 gismu. In learning Lojban, you need only to learn most of these gismu and their combining forms (known as *rafsi*) as well as perhaps 200 major *cmavo*, and you will be able to communicate effectively in the language. This may sound like a lot, but it is a small number compared to the vocabulary needed for similar communications in other languages.

All gismu have very strong form restrictions. Using the conventions defined in Section 4.1, all gismu are of the forms CVC/CV or CCVCV. They must meet the rules for all brivla given in Section 4.3; furthermore, they:

1. always have five letters;
2. always start with a consonant and end with a single vowel;
3. always contain exactly one consonant pair, which is a permissible initial pair (CC) if it's at the beginning of the gismu, but otherwise only has to be a permissible pair (C/C);
4. are always stressed on the first syllable (since that is penultimate).

The five letter length distinguishes gismu from lujvo and fu'ivla. (It is possible to have fu'ivla like “spa'i” that are five letters long, but they must have ‘;’; no gismu contains ‘.’) With the exception of five special brivla variables, “broda”, “brode”, “brodi”, “brodo”, and “brodu”, no two gismu differ only in the final vowel. Furthermore, the set of gismu was specifically designed to reduce the likelihood that two similar sounding gismu could be confused. For example, because “gismu” is in the set of gismu, “kismu”, “xismu”, “gicmu”, “gizmu”, and “gisnu” cannot be.

Almost all Lojban gismu are constructed from pieces of words drawn from other languages, specifically Chinese, English, Hindi, Spanish, Russian, and Arabic, the six most widely spoken natural languages. For a given concept, words in the six languages that represent that concept were written in Lojban phonetics. Then a gismu was selected to maximize the recognizability of the Lojban word for speakers of the six languages by weighting the inclusion of the sounds drawn from each language by the number of speakers of that language. See Section 4.14 for a full explanation of the algorithm.

Here are a few examples of gismu, with rough English equivalents (not full definitions):

**Definition 4.1**

<i>creka</i>	shirt
<i>lijda</i>	religion
<i>blanu</i>	blue
<i>mamta</i>	mother
<i>cukta</i>	book
<i>patfu</i>	father
<i>nanmu</i>	man
<i>ninmu</i>	woman

A small number of gismu were formed differently; see Section 4.15 for a list.

## 4.5 **lujvo**

When specifying a concept that is not found among the gismu (or, more specifically, when the relevant gismu seems too general in meaning), a Lojbanist generally attempts to express the concept as a tanru. Lojban tanru are an elaboration of the concept of “metaphor” used in English. In Lojban, any brivla can be used to modify another brivla. The first of the pair modifies the second. This modification is usually restrictive — the modifying brivla reduces the broader sense of the modified brivla to form a more narrow, concrete, or specific concept. Modifying brivla may thus be seen as acting like English adverbs or adjectives. For example,

**Example 4.5.1**

skami pilno

is the tanru which expresses the concept of “computer user”.

The simplest Lojban tanru are pairings of two concepts or ideas. Such tanru take two simpler ideas that can be represented by gismu and combine them into a single more complex idea. Two-part tanru may then be recombined in pairs with other tanru, or with individual gismu, to form more complex or more specific ideas, and so on.

The meaning of a tanru is usually at least partly ambiguous: “skami pilno” could refer to a computer that is a user, or to a user of computers. There are a variety of ways that the modifier component can be related to the modified component. It is also possible to use cmavo within tanru to provide variations (or to prevent ambiguities) of meaning.

Making tanru is essentially a poetic or creative act, not a science. While the syntax expressing the grouping relationships within tanru is unambiguous, tanru are still semantically ambiguous, since the rules defining the relationships between the gismu are flexible. The process of devising a new tanru is dealt with in detail in Chapter 5.

To express a simple tanru, simply say the component gismu together. Thus the binary metaphor “big boat” becomes the tanru

**Example 4.5.2**

barda bloti

representing roughly the same concept as the English word “ship”.

The binary metaphor “father mother” can refer to a paternal grandmother (“a father-ly type of mother”), while “mother father” can refer to a maternal grandfather (“a mother-ly type of father”). In Lojban, these become the tanru

**Example 4.5.3**  
patfu mamta

and

**Example 4.5.4**  
mamta patfu

respectively. The possibility of semantic ambiguity can easily be seen in the last case. To interpret Example 4.5.4, the listener must determine what type of motherliness pertains to the father being referred to. In an appropriate context, “mamta patfu” could mean not “grandfather” but simply “father with some motherly attributes”, depending on the culture. If absolute clarity is required, there are ways to expand upon and explain the exact interrelationship between the components; but such detail is usually not needed.

When a concept expressed in a tanru proves useful, or is frequently expressed, it is desirable to choose one of the possible meanings of the tanru and assign it to a new brivla. For Example 4.5.1, we would probably choose “user of computers”, and form the new word

**Example 4.5.5**  
sampli

Such a brivla, built from the rafsi which represent its component words, is called a *lujvo*. Another example, corresponding to the tanru of Example 4.5.2, would be:

**Example 4.5.6**  
bralo'i  
big-boat  
ship

The *lujvo* representing a given tanru is built from units representing the component gismu. These units are called *rafsi* in Lojban. Each rafsi represents only one gismu. The rafsi are attached together in the order of the words in the tanru, occasionally inserting so-called “hyphen” letters to ensure that the pieces stick together as a single word and cannot accidentally be broken apart into cmavo, gismu, or other word forms. As a result, each *lujvo* can be readily and accurately recognized, allowing a listener to pick out the word from a string of spoken Lojban, and if necessary, unambiguously decompose the word to a unique source tanru, thus providing a strong clue to its meaning. The *lujvo* that can be built from the tanru “mamta patfu” in Example 4.5.4 is

**Example 4.5.7**  
mampa'u

which refers specifically to the concept “maternal grandfather”. The two gismu that constitute the tanru are represented in “mampa'u” by the rafsi *mam-* and *-pa'u*, respectively; these two rafsi are then concatenated together to form “mampa'u”.

Like gismu, *lujvo* have only one meaning. When a *lujvo* is formally entered into a dictionary of the language, a specific definition will be assigned based on one particular interrelationship between the terms. (See Chapter 12 for how this has been done.) Unlike gismu, *lujvo* may have more than one form. This is because there is no difference in meaning between the various



rafsi for a gismu when they are used to build a lujvo. A long rafsi may be used, especially in noisy environments, in place of a short rafsi; the result is considered the same lujvo, even though the word is spelled and pronounced differently. Thus the word “brivla”, built from the tanru “bridi valsi”, is the same lujvo as “brivalsi”, “bridyvla”, and “bridyvalsi”, each of which uses a different combination of rafsi.

When assembling rafsi together into lujvo, the rules for valid brivla must be followed: a consonant cluster must occur in the first five letters (excluding *y* and *’*), and the lujvo must end in a vowel.

A *y* (which is ignored in determining stress or consonant clusters) is inserted in the middle of the consonant cluster to glue the word together when the resulting cluster is either not permissible or the word is likely to break up. There are specific rules describing these conditions, detailed in Section 4.6.

An *r* (in some cases, an *n*) is inserted when a CVV-form rafsi attaches to the beginning of a lujvo in such a way that there is no consonant cluster. For example, in the lujvo

**Example 4.5.8**

soirsai  
sonci sanmi  
soldier meal  
field rations

the rafsi *soi-* and *-sai* are joined, with the additional *r* making up the *rs* consonant pair needed to make the word a brivla. Without the *r*, the word would break up into “soi sai”, two cmavo. The pair of cmavo have no relation to their rafsi lookalikes; they will either be ungrammatical (as in this case), or will express a different meaning from what was intended.

Learning rafsi and the rules for assembling them into lujvo is clearly seen to be necessary for fully using the potential Lojban vocabulary.

Most important, it is possible to invent new lujvo while you speak or write in order to represent a new or unfamiliar concept, one for which you do not know any existing Lojban word. As long as you follow the rules for building these compounds, there is a good chance that you will be understood without explanation.

## 4.6 rafsi

Every gismu has from two to five rafsi, each of a different form, but each such rafsi represents only one gismu. It is valid to use any of the rafsi forms in building lujvo — whichever the reader or listener will most easily understand, or whichever is most pleasing — subject to the rules of lujvo making. There is a scoring algorithm which is intended to determine which of the possible and legal lujvo forms will be the standard dictionary form (see Section 4.12).

Each gismu always has at least two rafsi forms; one is the gismu itself (used only at the end of a lujvo), and one is the gismu without its final vowel (used only at the beginning or middle of a lujvo). These forms are represented as *-CVC/CV* or *-CCVCV* (called *the 5-letter rafsi*), and *-CVC/C-* or *-CCVC-* (called *the 4-letter rafsi*) respectively. The dashes in these rafsi form representations show where other rafsi may be attached to form a valid lujvo. When lujvo are formed only from 4-letter and 5-letter rafsi, known collectively as *long rafsi*, they are called *unreduced lujvo*.

Some examples of unreduced lujvo forms are:

**Example 4.6.1**

mamtypatfu  
 from “mamta patfu”  
 “mother father” or “maternal grandfather”

**Example 4.6.2**

lerfyliste  
 from “lerfu liste”  
 “letter list” or a “list of letters”  
 (letters of the alphabet)

**Example 4.6.3**

nancyprali  
 from “nanca prali”  
 “year profit” or “annual profit”

**Example 4.6.4**

prunyplipe  
 from “pruni plipe”  
 “elastic (springy) leap” or “spring” (the verb)

**Example 4.6.5**

vancysanmi  
 from “vanci sanmi”  
 “evening meal” or “supper”

In addition to these two forms, each gismu may have up to three additional short rafsi, three letters long. All short rafsi have one of the forms -CVC-, -CCV-, or -CVV-. The total number of rafsi forms that are assigned to a gismu depends on how useful the gismu is, or is presumed to be, in making lujvo, when compared to other gismu that could be assigned the rafsi.

For example, “zmadu” (“more than”) has the two short rafsi *-zma-* and *-mau-* (in addition to its unreduced rafsi *-zmad-* and *-zmadu*), because a vast number of lujvo have been created based on “zmadu”, corresponding in general to English comparative adjectives ending in *-er* such as “whiter” (Lojban “labmau”). On the other hand, “bakri” (“chalk”) has no short rafsi and few lujvo.

There are at most one CVC-form, one CCV-form, and one CVV-form rafsi per gismu. In fact, only a tiny handful of gismu have both a CCV-form and a CVV-form rafsi assigned, and still fewer have all three forms of short rafsi. However, gismu with both a CVC-form and another short rafsi are fairly common, partly because more possible CVC-form rafsi exist. Yet CVC-form rafsi, even though they are fairly easy to remember, cannot be used at the end of a lujvo (because lujvo must end in vowels), so justifying the assignment of an additional short rafsi to many gismu.

The intention was to use the available “rafsi space” — the set of all possible short rafsi forms — in the most efficient way possible; the goal is to make the most-used lujvo as short as possible (thus maximizing the use of short rafsi), while keeping the rafsi very recognizable to anyone who knows the source gismu. For this reason, the letters in a rafsi have always been chosen from among the five letters of the corresponding gismu. As a result, there are a limited set

of short rafsi available for assignment to each gismu. At most seven possible short rafsi are available for consideration (of which at most three can be used, as explained above).

Here are the only short rafsi forms that can possibly exist for gismu of the form CVC/CV, like “sakli”. The digits in the second column represent the gismu letters used to form the rafsi.

Form	Letters Used	Rafsi
CVC	123	-sak-
CVC	124	-sal-
CVV	12'5	-sa'i-
CVV	125	-sai-
CCV	345	-kli-
CCV	132	-ska-

(The only actual short rafsi for “sakli” is -sal-.) For gismu of the form CCVCV, like “blaci”, the only short rafsi forms that can exist are:

Form	Letters Used	Rafsi
CVC	134	-bac-
CVC	234	-lac
CVV	13'5	-ba'i-
CVV	135	-bai-
CVV	23'5	-la'i-
CVV	235	-lai-
CCV	123	-bla-

(In fact, “blaci” has none of these short rafsi; they are all assigned to other gismu. Lojban speakers are not free to reassign any of the rafsi; the tables shown here are to help understand how the rafsi were chosen in the first place.)

There are a few restrictions: a CVV-form rafsi without an apostrophe cannot exist unless the vowels make up one of the four diphthongs *ai*, *ei*, *oi*, or *au*; and a CCV-form rafsi is possible only if the two consonants form a permissible initial consonant pair (see Section 4.1). Thus “mamta”, which has the same form as “salci”, can only have *mam*, *mat*, and *ma'a* as possible rafsi: in fact, only *mam* is assigned to it.

Some cmavo also have associated rafsi, usually CVC-form. For example, the ten common numerical digits, which are all CV form cmavo, each have a CVC-form rafsi formed by adding a consonant to the cmavo. Most cmavo that have rafsi are ones used in composing tanru (for a complete list, see Chapter 12).

The term for a lujvo made up solely of short rafsi is “fully reduced lujvo”. Here are some examples of fully reduced lujvo:

**Example 4.6.6**

cumfri  
 from “cumki lifri”  
 “possible experience”

**Example 4.6.7**

klezba  
 from “klesi zbasu”  
 “category make”

**Example 4.6.8**

kixta’a  
 from “krixa tavla”  
 “cry-out talk”

**Example 4.6.9**

sniju’o  
 from “sinxa djuno”  
 “sign know”

In addition, some of the unreduced forms in the previous example may be fully reduced to:

**Example 4.6.10**

mampa’u  
 from “mamta patfu”  
 “mother father” or “maternal grandfather”

**Example 4.6.11**

lerste  
 from “lerfu liste”  
 “letter list” or a “list of letters”

As noted above, CVC-form rafsi cannot appear as the final rafsi in a lujvo, because all lujvo must end with one or two vowels. As a brivla, a lujvo must also contain a consonant cluster within the first five letters — this ensures that they cannot be mistaken for compound cmavo. Of course, all lujvo have at least six letters since they have two or more rafsi, each at least three letters long; hence they cannot be confused with gismu. When attaching two rafsi together, it may be necessary to insert a hyphen letter. In Lojban, the term “hyphen” always refers to a letter, either the vowel *y* or one of the consonants *r* and *n*. (The letter *l* can also be a hyphen, but is not used as one in lujvo.)

The *y*-hyphen is used after a CVC-form rafsi when joining it with the following rafsi could result in an impermissible consonant pair, or when the resulting lujvo could fall apart into two or more words (either cmavo or gismu).

Thus, the tanru “pante tavla” (“protest talk”) cannot produce the lujvo “patta’a”, because *tt* is not a permissible consonant pair; the lujvo must be “patyta’a”. Similarly, the tanru “mudri siclu” (“wooden whistle”) cannot form the lujvo “mudsiclu”; instead, “mudysiclu” must be used. (Remember that *y* is not counted in determining whether the first five letters of a brivla contain a consonant cluster: this is why.)

The *y*-hyphen is also used to attach a 4-letter rafsi, formed by dropping the final vowel of a gismu, to the following rafsi. (This procedure was shown, but not explained, in Example 4.6.1 to Example 4.6.5.) The lujvo forms “zunlyjamfu”, “zunlyjma”, “zuljamfu”, and “zuljma” are all legitimate and equivalent forms made from the tanru “zunle jamfu” (“left foot”). Of these, “zuljma” is the preferred one since it is the shortest; it thus is likely to be the form listed in a Lojban dictionary.

The *r*-hyphen and its close relative, the *n*-hyphen, are used in *lujvo* only after CVV-form rafsi. A hyphen is always required in a two-part *lujvo* of the form CVV-CVV, since otherwise there would be no consonant cluster.

An *r*-hyphen or *n*-hyphen is also required after the CVV-form rafsi of any *lujvo* of the form CVV-CVC/CV or CVV-CCVCV since it would otherwise fall apart into a CVV-form *cmavo* and a *gismu*. In any *lujvo* with more than two parts, a CVV-form rafsi in the initial position must always be followed by a hyphen. If the hyphen were to be omitted, the supposed *lujvo* could be broken into smaller words without the hyphen: because the CVV-form rafsi would be interpreted as a *cmavo*, and the remainder of the word as a valid *lujvo* that is one rafsi shorter.

An *n*-hyphen is only used in place of an *r*-hyphen when the following rafsi begins with *r*. For example, the *tanru* “rokci renro” (“rock throw”) cannot be expressed as “ro’ire’o” (which breaks up into two *cmavo*), nor can it be “ro’irre’o” (which has an impermissible double consonant); the *n*-hyphen is required, and the correct form of the hyphenated *lujvo* is “ro’inre’o”. The same *lujvo* could also be expressed without hyphenation as “rokre’o”.

There is also a different way of building *lujvo*, or rather phrases which are grammatically and semantically equivalent to *lujvo*. You can make a phrase containing any desired words, joining each pair of them with the special *cmavo* “zei”. Thus,

**Example 4.6.12**

bridi zei valsi

is the exact equivalent of “brivla” (but not necessarily the same as the underlying *tanru* “bridi valsi”, which could have other meanings.) Using “zei” is the only way to get a *cmavo* lacking a rafsi, a *cmene*, or a *fu’ivla* into a *lujvo*:

**Example 4.6.13**

xy. zei kantu  
X ray

**Example 4.6.14**

kulnr,farsi zei lolgai  
Farsi floor-cover  
Persian rug

**Example 4.6.15**

na’e zei .a zei na’e zei by. livgyterbilma  
non-A, non-B liver-disease  
non-A, non-B hepatitis

**Example 4.6.16**

.cerman. zei xarnykarce  
Sherman war-car  
Sherman tank

Example 4.6.15 is particularly noteworthy because the phrase that would be produced by removing the “zei”s from it doesn’t end with a *brivla*, and in fact is not even grammatical. As written, the example is a *tanru* with two components, but by adding a “zei” between “by.” and “livgyterbilma” to produce

**Example 4.6.17**

na'e zei .a zei na'e zei by. zei livgyterbilma  
non-A-non-B-hepatitis

the whole phrase would become a single *lujvo*. The longer *lujvo* of Example 4.6.17 may be preferable, because its place structure can be built from that of “bilma”, whereas the place structure of a *lujvo* without a *brivla* must be constructed *ad hoc*.

Note that *rafsi* may not be used in “*zei*” phrases, because they are not words. CVV *rafsi* look like words (specifically *cmavo*) but there can be no confusion between the two uses of the same letters, because *cmavo* appear only as separate words or in compound *cmavo* (which are really just a notation for writing separate but closely related words as if they were one); *rafsi* appear only as parts of *lujvo*.

## 4.7 fu'ivla

The use of *tanru* or *lujvo* is not always appropriate for very concrete or specific terms (e.g. “brie” or “cobra”), or for jargon words specialized to a narrow field (e.g. “quark”, “integral”, or “iambic pentameter”). These words are in effect names for concepts, and the names were invented by speakers of another language. The vast majority of words referring to plants, animals, foods, and scientific terminology cannot be easily expressed as *tanru*. They thus must be borrowed (actually “copied”) into Lojban from the original language.

There are four stages of borrowing in Lojban, as words become more and more modified (but shorter and easier to use). Stage 1 is the use of a foreign name quoted with the *cmavo* “*la'o*” (explained in full in Chapter 19):

**Example 4.7.1**

me *la'o ly. spaghetti .ly.*

is a predicate with the place structure “ $x_1$  is a quantity of spaghetti”. Stage 2 involves changing the foreign name to a Lojbanized name, as explained in Section 4.8:

**Example 4.7.2**

me *la spagetis.*

One of these expedients is often quite sufficient when you need a word quickly in conversation. (This can make it easier to get by when you do not yet have full command of the Lojban vocabulary, provided you are talking to someone who will recognize the borrowing.)

Where a little more universality is desired, the word to be borrowed must be Lojbanized into one of several permitted forms. A *rafsi* is then usually attached to the beginning of the Lojbanized form, using a hyphen to ensure that the resulting word doesn't fall apart.

The *rafsi* categorizes or limits the meaning of the *fu'ivla*; otherwise a word having several different jargon meanings in other languages would require the word-inventor to choose which meaning should be assigned to the *fu'ivla*, since *fu'ivla* (like other *brivla*) are not permitted to have more than one definition. Such a Stage 3 borrowing is the most common kind of *fu'ivla*.

Finally, Stage 4 *fu'ivla* do not have any *rafsi* classifier, and are used where a *fu'ivla* has become so common or so important that it must be made as short as possible. (See Section 4.16 for a proposal concerning Stage 4 *fu'ivla*.)

The form of a fu'ivla reliably distinguishes it from both the gismu and the cmavo. Like cultural gismu, fu'ivla are generally based on a word from a single non-Lojban language. The word is “borrowed” (actually “copied”, hence the Lojban tanru “fukpi valsi”) from the other language and Lojbanized — the phonemes are converted to their closest Lojban equivalent and modifications are made as necessary to make the word a legitimate Lojban fu'ivla-form word. All fu'ivla:

1. must contain a consonant cluster in the first five letters of the word; if this consonant cluster is at the beginning, it must either be a permissible initial consonant pair, or a longer cluster such that each pair of adjacent consonants in the cluster is a permissible initial consonant pair: “spraile” is acceptable, but not “ktraile” or “trkaile”;
2. must end in one or more vowels;
3. must not be gismu or lujvo, or any combination of cmavo, gismu, and lujvo; furthermore, a fu'ivla with a CV cmavo joined to the front of it must not have the form of a lujvo (the so-called “slinku'i test”);
4. cannot contain *y*, although they may contain syllabic pronunciations of Lojban consonants;
5. like other brivla, are stressed on the penultimate syllable.

Note that consonant triples or larger clusters that are not at the beginning of a fu'ivla can be quite flexible, as long as all consonant pairs are permissible. There is no need to restrict fu'ivla clusters to permissible initial pairs except at the beginning.

This is a fairly liberal definition and allows quite a lot of possibilities within “fu'ivla space”. Stage 3 fu'ivla can be made easily on the fly, as lujvo can, because the procedure for forming them always guarantees a word that cannot violate any of the rules. Stage 4 fu'ivla require running tests that are not simple to characterize or perform, and should be made only after deliberation and by someone knowledgeable about all the considerations that apply.

Here is a simple and reliable procedure for making a non-Lojban word into a valid Stage 3 fu'ivla:

1. Eliminate all double consonants and silent letters.
2. Convert all sounds to their closest Lojban equivalents. Lojban *y*, however, may not be used in any fu'ivla.
3. If the last letter is not a vowel, modify the ending so that the word ends in a vowel, either by removing a final consonant or by adding a suggestively chosen final vowel.
4. If the first letter is not a consonant, modify the beginning so that the word begins with a consonant, either by removing an initial vowel or adding a suggestively chosen initial consonant.
5. Prefix the result of steps 1–5 with a 4-letter rafsi that categorizes the fu'ivla into a “topic area”. It is only safe to use a 4-letter rafsi; short rafsi sometimes produce invalid fu'ivla. Hyphenate the rafsi to the rest of the fu'ivla with an *r*-hyphen; if that would produce a double *r*, use an *n*-hyphen instead; if the rafsi ends in *r* and the rest of the fu'ivla begins with *n* (or vice versa) use an *l*-hyphen. (This is the only use of *l*-hyphen in Lojban.) Alternatively, if a CVC-form short rafsi is available it can be used instead of the long rafsi.

6. Remember that the stress necessarily appears on the penultimate (next-to-the-last) syllable.

In this section, the hyphen is set off with commas in the examples, but these commas are not required in writing, and the hyphen need not be pronounced as a separate syllable. Here are a few examples:

**Example 4.7.3**

spaghetti (from English or Italian)  
 spageti (Lojbanize)  
 cidj,r,spageti (prefix long rafsi)  
 dja,r,spageti (prefix short rafsi)

where *cidj-* is the 4-letter rafsi for “cidja”, the Lojban gismu for “food”, thus categorizing “cidjrspageti” as a kind of food. The form with the short rafsi happens to work, but such good fortune cannot be relied on: in any event, it means the same thing.

**Example 4.7.4**

Acer (the scientific name of maple trees)  
 acer (Lojbanize)  
 xaceru (add initial consonant and final vowel)  
 tric,r,xaceru (prefix rafsi)  
 ric,r,xaceru (prefix short rafsi)

where *tric-* and *ric-* are rafsi for “tricu”, the gismu for “tree”. Note that by the same principles, “maple sugar” could get the fu'ivla “saktrxaceru”, or could be represented by the tanru “tricrxaceru sakta”. Technically, “ricrxaceru” and “tricrxaceru” are distinct fu'ivla, but they would surely be given the same meanings if both happened to be in use.

**Example 4.7.5**

brie (from French)  
 bri (Lojbanize)  
 cirl,r,bri (prefix rafsi)

where *cirl-* represents “cirla” (“cheese”).

**Example 4.7.6**

cobra  
 kobra (Lojbanize)  
 sinc,r,kobra (prefix rafsi)

where *sinc-* represents “since” (“snake”).

**Example 4.7.7**

quark  
 kuark (Lojbanize)  
 kuarka (add final vowel)  
 sask,r,kuarka (prefix rafsi)



where *sask-* represents “saske” (“science”). Note the extra vowel *a* added to the end of the word, and the diphthong *q(ua)*, which never appears in *gismu* or *lujvo*, but may appear in *fu’ivla*.

The use of the prefix helps distinguish among the many possible meanings of the borrowed word, depending on the field. As it happens, “spageti” and “kuarka” are valid Stage 4 *fu’ivla*, but “xaceru” looks like a compound *cmavo*, and “kobra” like a *gismu*.

For another example, “integral” has a specific meaning to a mathematician. But the Lojban *fu’ivla* “integrale”, which is a valid Stage 4 *fu’ivla*, does not convey that mathematical sense to a non-mathematical listener, even one with an English-speaking background; its source — the English word “integral” — has various other specialized meanings in other fields.

Left uncontrolled, “integrale” almost certainly would eventually come to mean the same collection of loosely related concepts that English associates with “integral”, with only the context to indicate (possibly) that the mathematical term is meant.

The prefix method would render the mathematical concept as “*cmacrntegrale*”, if the *i* of “integrale” is removed, or something like “*cmacrntintegrale*”, if a new consonant is added to the beginning; *cmac-* is the *rafsi* for “*cmaci*” (“mathematics”). The architectural sense of “integral” might be conveyed with “*djinrntegrale*” or “*tarmrntegrale*”, where “*dinju*” and “*tarmi*” mean “building” and “form” respectively.

Here are some *fu’ivla* representing cultures and related things, shown with more than one *rafsi* prefix:

**Example 4.7.8**

bang,r,blgaria  
Bulgarian (in language)

**Example 4.7.9**

kuln,r,blgaria  
Bulgarian (in culture)

**Example 4.7.10**

gugd,r,blgaria  
Bulgaria (the country)

**Example 4.7.11**

bang,r,kore,a  
Korean (the language)

**Example 4.7.12**

kuln,r,kore,a  
Korean (the culture)

Note the commas in Example 4.7.11 and Example 4.7.12, used because *ea* is not a valid diphthong in Lojban. Arguably, some form of the native name “Chosen” should have been used instead of the internationally known “Korea”; this is a recurring problem in all borrowings. In general, it is better to use the native name unless using it will severely impede understanding: “Navajo” is far more widely known than “Dine’e”.

## 4.8 *cmene*

Lojbanized names, called *cmene*, are very much like their counterparts in other languages. They are labels applied to things (or people) to stand for them in descriptions or in direct address. They may convey meaning in themselves, but do not necessarily do so.

Because names are often highly personal and individual, Lojban attempts to allow native language names to be used with a minimum of modification. The requirement that the Lojban speech stream be unambiguously analyzable, however, means that most names must be modified somewhat when they are Lojbanized. Here are a few examples of English names and possible Lojban equivalents:

**Example 4.8.1**

djim.  
Jim

**Example 4.8.2**

djein.  
Jane

**Example 4.8.3**

.arnold.  
Arnold

**Example 4.8.4**

pit.  
Pete

**Example 4.8.5**

katrinas.  
Katrina

**Example 4.8.6**

kat,r,in.  
Catherine

(Note that syllabic *r* is skipped in determining the stressed syllable, so Example 4.8.6 is stressed on the *ka*.)

**Example 4.8.7**

katis.  
Cathy

**Example 4.8.8**

keit.  
Kate

Names may have almost any form, but always end in a consonant, and are followed by a pause. They are penultimately stressed, unless unusual stress is marked with capitalization. A name may have multiple parts, each ending with a consonant and pause, or the parts may be combined into a single word with no pause. For example,

**Example 4.8.9**

djan. djonz.

and

**Example 4.8.10**

djandjonz.

are both valid Lojbanizations of “John Jones”. The final arbiter of the correct form of a name is the person doing the naming, although most cultures grant people the right to determine how they want their own name to be spelled and pronounced. The English name “Mary” can thus be Lojbanized as “meris.”, “maris.”, “meiris.”, “merix.”, or even “marys.”. The last alternative is not pronounced much like its English equivalent, but may be desirable to someone who values spelling over pronunciation. The final consonant need not be an *s*; there must, however, be some Lojban consonant at the end.

Names are not permitted to have the sequences “la”, “lai”, or “doi” embedded in them, unless the sequence is immediately preceded by a consonant. These minor restrictions are due to the fact that all Lojban cmene embedded in a speech stream will be preceded by one of these words or by a pause. With one of these words embedded, the cmene might break up into valid Lojban words followed by a shorter cmene. However, break-up cannot happen after a consonant, because that would imply that the word before the “la”, or whatever, ended in a consonant without pause, which is impossible.

For example, the invalid name “laplas.” would look like the Lojban words “la plas.”, and “ilanas.” would be misunderstood as “.i la nas.”. However, “nederlants.” cannot be misheard as “neder lants.”, because “neder” with no following pause is not a possible Lojban word.

There are close alternatives to these forbidden sequences that can be used in Lojbanizing names, such as “ly”, “lei”, and “dai” or “do’i”, that do not cause these problems.

Lojban cmene are identifiable as word forms by the following characteristics:

1. They must end in one or more consonants. There are no rules about how many consonants may appear in a cluster in cmene, provided that each consonant pair (whether standing by itself, or as part of a larger cluster) is a permissible pair.
2. They may contain the letter *y* as a normal, non-hyphenating vowel. They are the only kind of Lojban word that may contain the two diphthongs *iy* and *uy*.
3. They are always followed in speech by a pause after the final consonant, written as ..
4. They may be stressed on any syllable; if this syllable is not the penultimate one, it must be capitalized when writing. Neither names nor words that begin sentences are capitalized in Lojban, so this is the only use of capital letters.

Names meeting these criteria may be invented, Lojbanized from names in other languages, or formed by appending a consonant onto a cmavo, a gismu, a fu’ivla or a lujvo. Some cmene built from Lojban words are:

**Example 4.8.11**

pav.

the One

from the cmavo “pa”, with rafsi *pav*, meaning “one”

**Example 4.8.12**

sol.  
the Sun  
from the gismu “solri”, meaning “solar”, or actually “pertaining to the Sun”

**Example 4.8.13**

ralj.  
Chief (as a title) from the gismu “ralju”, meaning “principal”.

**Example 4.8.14**

nol.  
Lord/Lady  
from the gismu “nobli”, with rafsi *nol*, meaning “noble”.

To Lojbanize a name from the various natural languages, apply the following rules:

1. Eliminate double consonants and silent letters.
2. Add a final *s* or *n* (or some other consonant that sounds good) if the name ends in a vowel.
3. Convert all sounds to their closest Lojban equivalents.
4. If possible and acceptable, shift the stress to the penultimate (next-to-the-last) syllable. Use commas and capitalization in written Lojban when it is necessary to preserve non-standard syllabication or stress. Do not capitalize names otherwise.
5. If the name contains an impermissible consonant pair, insert a vowel between the consonants: *y* is recommended.
6. No cmene may have the syllables “la”, “lai”, or “doi” in them, unless immediately preceded by a consonant. If these combinations are present, they must be converted to something else. Possible substitutions include “ly”, “ly’i”, and “dai” or “do’i”, respectively.

There are some additional rules for Lojbanizing the scientific names (technically known as “Linnaean binomials” after their inventor) which are internationally applied to each species of animal or plant. Where precision is essential, these names need not be Lojbanized, but can be directly inserted into Lojban text using the cmavo “la’o”, explained in Chapter 19. Using this cmavo makes the already lengthy Latinized names at least four syllables longer, however, and leaves the pronunciation in doubt. The following suggestions, though incomplete, will assist in converting Linnaean binomials to valid Lojban names. They can also help to create fu’ivla based on Linnaean binomials or other words of the international scientific vocabulary. The term “back vowel” in the following list refers to any of the letters *a*, *o*, or *u*; the term “front vowel” correspondingly refers to any of the letters *e*, *i*, or *y*.

1. Change double consonants other than *cc* to single consonants.
2. Change *cc* before a front vowel to *kc*, but otherwise to *k*.
3. Change *c* before a back vowel and final *c* to *k*.
4. Change *ng* before a consonant (other than *h*) and final *ng* to *n*.

5. Change *x* to *z* initially, but otherwise to *ks*.
6. Change *pn* to *n* initially.
7. Change final *ie* and *ii* to *i*.
8. Make the following idiosyncratic substitutions: *aa* to *a*, *ae* to *e*, *ch* to *k*, *ee* to *i*, *igh* to *ei*, *ew* to *u*, *igh* to *ai*, *oo* to *u*, *ou* to *u*, *ow* to *u*, *ph* to *f*, *q* to *k*, *sc* to *k*, *w* to *u* and *y* to *i*. However, the diphthong substitutions should not be done if the two vowels are in two different syllables.
9. Change *h* between two vowels to *'*, but otherwise remove it completely. If preservation of the *h* seems essential, change it to *x* instead.
10. Place *'* between any remaining vowel pairs that do not form Lojban diphthongs.

Some further examples of Lojbanized names are:

**Definition 4.2**

<i>Mary</i>	meris. or meiris.	English
<i>Smith</i>	smit.	English
<i>Jones</i>	djonz.	English
<i>John</i>	djan. or jan.	(American) English
<i>John</i>	djon. or jon.	(British) English
<i>Alice</i>	.alis.	English
<i>Elise</i>	.eLIS.	English
<i>Johnson</i>	djansn.	English
<i>William</i>	.uiliam. or .uil,iam.	English
<i>Brown</i>	braun.	English
<i>Charles</i>	tcarlz.	English
<i>Charles</i>	carl.	French
<i>De Gaulle</i>	dyGOL.	French
<i>Heinrich</i>	xainrix.	German
<i>Joaquin</i>	xuaKIN.	Spanish
<i>Svetlana</i>	sfietlanys.	Russian
<i>Svetlana</i>	xrucTCOF.	Russian
<i>Krishna</i>	kricnas.	Hindi
<i>Lech Walesa</i>	lex. va,uensas.	Polish
<i>Don Quixote</i>	don. kicotes.	Spanish
<i>Don Quixote</i>	don. kixotes.	Modern Spanish
<i>Don Quixote</i>	don. ki'otes.	(Mexican Dialect) Spanish
<i>Mao Zedong</i>	maudzydyn.	Chinese
<i>Fujiko</i>	fudjikos. or fujikos.	Japanese

## 4.9 Rules for inserting pauses

Summarized in one place, here are the rules for inserting pauses between Lojban words:

1. Any two words may have a pause between them; it is always illegal to pause in the middle of a word, because that breaks up the word into two words.

2. Every word ending in a consonant must be followed by a pause. Necessarily, all such words are cmene.
3. Every word beginning with a vowel must be preceded by a pause. Such words are either cmavo, fu'ivla, or cmene; all gismu and lujvo begin with consonants.
4. Every cmene must be preceded by a pause, unless the immediately preceding word is one of the cmavo “la”, “lai”, “la'i”, or “doi” (which is why those strings are forbidden in cmene). However, the situation triggering this rule rarely occurs.
5. If the last syllable of a word bears the stress, and a brivla follows, the two must be separated by a pause, to prevent confusion with the primary stress of the brivla. In this case, the first word must be either a cmavo or a cmene with unusual stress (which already ends with a pause, of course).
6. A cmavo of the form Cy must be followed by a pause unless another Cy-form cmavo follows.
7. When non-Lojban text is embedded in Lojban, it must be preceded and followed by pauses. (How to embed non-Lojban text is explained in Chapter 19.)

## 4.10 Considerations for making lujvo

Given a tanru which expresses an idea to be used frequently, it can be turned into a lujvo by following the lujvo-making algorithm which is given in Section 4.11.

In building a lujvo, the first step is to replace each gismu with a rafsi that uniquely represents that gismu. These rafsi are then attached together by fixed rules that allow the resulting compound to be recognized as a single word and to be analyzed in only one way.

There are three other complications; only one is serious.

The first is that there is usually more than one rafsi that can be used for each gismu. The one to be used is simply whichever one sounds or looks best to the speaker or writer. There are usually many valid combinations of possible rafsi. They all are equally valid, and all of them mean exactly the same thing. (The scoring algorithm given in Section 4.12 is used to choose the standard form of the lujvo — the version which would be entered into a dictionary.)

The second complication is the serious one. Remember that a tanru is ambiguous — it has several possible meanings. A lujvo, or at least one that would be put into the dictionary, has just a single meaning. Like a gismu, a lujvo is a predicate which encompasses one area of the semantic universe, with one set of places. Hopefully the meaning chosen is the most useful of the possible semantic spaces. A possible source of linguistic drift in Lojban is that as Lojbanic society evolves, the concept that seems the most useful one may change.

You must also be aware of the possibility of some prior meaning of a new lujvo, especially if you are writing for posterity. If a lujvo is invented which involves the same tanru as one that is in the dictionary, and is assigned a different meaning (or even just a different place structure), linguistic drift results. This isn't necessarily bad. Every natural language does it. But in communication, when you use a meaning different from the dictionary definition, someone else may use the dictionary and therefore misunderstand you. You can use the cmavo “za'e” (explained in Chapter 19) before a newly coined lujvo to indicate that it may have a non-dictionary meaning.

The essential nature of human communication is that if the listener understands, then all is well. Let this be the ultimate guideline for choosing meanings and place structures for invented lujvo.

The third complication is also simple, but tends to scare new Lojbanists with its implications. It is based on Zipf's Law, which says that the length of words is inversely proportional to their usage. The shortest words are those which are used more; the longest ones are used less. Conversely, commonly used concepts will tend to be abbreviated. In English, we have abbreviations and acronyms and jargon, all of which represent complex ideas that are used often by small groups of people, so they shortened them to convey more information more rapidly.

Therefore, given a complicated tanru with grouping markers, abstraction markers, and other cmavo in it to make it syntactically unambiguous, the psychological basis of Zipf's Law may compel the *lujvo*-maker to drop some of the cmavo to make a shorter (technically incorrect) tanru, and then use that tanru to make the *lujvo*.

This doesn't lead to ambiguity, as it might seem to. A given *lujvo* still has exactly one meaning and place structure. It is just that more than one tanru is competing for the same *lujvo*. But more than one meaning for the tanru was already competing for the "right" to define the meaning of the *lujvo*. Someone has to use judgment in deciding which one meaning is to be chosen over the others.

If the *lujvo* made by a shorter form of tanru is in use, or is likely to be useful for another meaning, the decider then retains one or more of the cmavo, preferably ones that set this meaning apart from the shorter form meaning that is used or anticipated. As a rule, therefore, the shorter *lujvo* will be used for a more general concept, possibly even instead of a more frequent word. If both words are needed, the simpler one should be shorter. It is easier to add a cmavo to clarify the meaning of the more complex term than it is to find a good alternate tanru for the simpler term.

And of course, we have to consider the listener. On hearing an unknown word, the listener will decompose it and get a tanru that makes no sense or the wrong sense for the context. If the listener realizes that the grouping operators may have been dropped out, he or she may try alternate groupings, or try inserting an abstraction operator if that seems plausible. (The grouping of tanru is explained in Chapter 5; abstraction is explained in Chapter 11.) Plausibility is the key to learning new ideas and to evaluating unfamiliar *lujvo*.

## 4.11 The *lujvo*-making algorithm

The following is the current algorithm for generating Lojban *lujvo* given a known tanru and a complete list of *gismu* and their assigned *rafsi*. The algorithm was designed by Bob LeChevalier and Dr. James Cooke Brown for computer program implementation. It was modified in 1989 with the assistance of Nora LeChevalier, who detected a flaw in the original "tосmabru test".

Given a tanru that is to be made into a *lujvo*:

1. Choose a 3-letter or 4-letter *rafsi* for each of the *gismu* and cmavo in the tanru except the last.
2. Choose a 3-letter (CVV-form or CCV-form) or 5-letter *rafsi* for the final *gismu* in the tanru.
3. Join the resulting string of *rafsi*, initially without hyphens.
4. Add hyphen letters where necessary. It is illegal to add a hyphen at a place that is not required by this algorithm. Right-to-left tests are recommended, for reasons discussed below.

- (a) If there are more than two words in the *tanru*, put an *r*-hyphen (or an *n*-hyphen) after the first *rafsi* if it is CVV-form. If there are exactly two words, then put an *r*-hyphen (or an *n*-hyphen) between the two *rafsi* if the first *rafsi* is CVV-form, unless the second *rafsi* is CCV-form (for example, “*saicli*” requires no hyphen). Use an *r*-hyphen unless the letter after the hyphen is *r*, in which case use an *n*-hyphen. Never use an *n*-hyphen unless it is required.
  - (b) Put a *y*-hyphen between the consonants of any impermissible consonant pair. This will always appear between *rafsi*.
  - (c) Put a *y*-hyphen after any 4-letter *rafsi* form.
5. Test all forms with one or more initial CVC-form *rafsi* — with the pattern CVC ... CVC + X — for “*tosmabru* failure”. X must either be a CVCCV long *rafsi* that happens to have a permissible initial pair as the consonant cluster, or is something which has caused a *y*-hyphen to be installed between the previous CVC and itself by one of the above rules. The test is as follows:
- (a) Examine all the C/C consonant pairs that join the CVC *rafsi*, and also the pair between the last CVC and the X portion, ignoring any *y*-hyphen before the X. These consonant pairs are called *joints*.
  - (b) If all of those joints are permissible initials, then the trial word will break up into a *cmavo* and a shorter *brivla*. If not, the word will not break up, and no further hyphens are needed.
  - (c) Install a *y*-hyphen at the first such joint.

Note that the “*tosmabru* test” implies that the algorithm will be more efficient if *rafsi* junctures are tested for required hyphens from right to left, instead of from left to right; when the test is required, it cannot be completed until hyphenation to the right has been determined.

## 4.12 The *lujvo* scoring algorithm

This algorithm was devised by Bob and Nora LeChevalier in 1989. It is not the only possible algorithm, but it usually gives a choice that people find preferable. The algorithm may be changed in the future. The lowest-scoring variant will usually be the dictionary form of the *lujvo*. (In previous versions, it was the highest-scoring variant.)

1. Count the total number of letters, including hyphens and apostrophes; call it *L*.
2. Count the number of apostrophes; call it *A*.
3. Count the number of *y*-, *r*-, and *n*-hyphens; call it *H*.
4. For each *rafsi*, find the value in the table below. Sum this value over all *rafsi*; call it *R*.
5. Count the number of vowels, not including *y*; call it *V*.
6. The score is then:  $(1000 \times L) - (500 \times A) + (100 \times H) - (10 \times R) - V$

In case of ties, there is no preference. This should be rare. Note that the algorithm essentially encodes a hierarchy of priorities: short words are preferred (counting apostrophes as half a letter), then words with fewer hyphens, words with more pleasing *rafsi* (this judgment is subjective), and finally words with more vowels are chosen. Each decision principle is applied



CVC/CV	(final) <i>-sarji</i>	1
CVC/C	<i>-sarj-</i>	2
CCVCV	(final) <i>-zbasu</i>	3
CCVC	<i>-zbas-</i>	4
CVC	<i>-nun-</i>	5
CVV	<i>-ta'u-</i>	6
CCV	<i>-zba-</i>	7
CVV	<i>-sai-</i>	8

in turn if the ones before it have failed to choose; it is possible that a lower-ranked principle might dominate a higher-ranked one if it is ten times better than the alternative.

Here are some *lujvo* with their scores (not necessarily the lowest scoring forms for these *lujvo*, nor even necessarily sensible *lujvo*):

**Example 4.12.1**

zbasai

*zba + sai*

$$(1000 \times 6) - (500 \times 0) + (100 \times 0) - (10 \times 15) - 3 = 5847$$

**Example 4.12.2**

nunynau

*nun + y + nau*

$$32500 - (1000 \times 7) + (500 \times 0) - (100 \times 1) + (10 \times 13) + 3 = 6967$$

**Example 4.12.3**

sairzbata'u

*sai + r + zba + ta'u*

$$32500 - (1000 \times 11) + (500 \times 1) - (100 \times 1) + (10 \times 21) + 5 = 10385$$

**Example 4.12.4**

zbazbasysarji

*zba + zbas + y + sarji*

$$32500 - (1000 \times 13) + (500 \times 0) - (100 \times 1) + (10 \times 12) + 4 = 12976$$

## 4.13 *lujvo*-making examples

This section contains examples of making and scoring *lujvo*. First, we will start with the *tanru* “gerku zdani” (“dog house”) and construct a *lujvo* meaning “doghouse”, that is, a house where a dog lives. We will use a brute-force application of the algorithm in Section 4.12, using every possible *rafsi*.

The *rafsi* for “gerku” are: *-ger-*, *-ge'u-*, *-gerk-* and *q(-gerku)*. The *rafsi* for “zdani” are: *-zda-*, *-zdan-* and *-zdani*.

Step 1 of the algorithm directs us to use *-ger-*, *-ge'u-* and *-gerk-* as possible *rafsi* for “gerku”; Step 2 directs us to use *-zda-* and *-zdani* as possible *rafsi* for *zdani*. The six possible forms of the *lujvo* are then “ger-zda”, “ger-zdani”, “ge'u-zda”, “ge'u-zdani”, “gerk-zda” and “gerk-zdani”.

We must then insert appropriate hyphens in each case. The first two forms need no hyphenation: *ge* cannot fall off the front, because the following word would begin with *rz*, which is not a permissible initial consonant pair. So the lujvo forms are “gerzda” and “gerzdani”.

The third form, “ge’u-zda”, needs no hyphen, because even though the first rafsi is CVV, the second one is CCV, so there is a consonant cluster in the first five letters. So “ge’uzda” is this form of the lujvo.

The fourth form, “ge’u-zdani”, however, requires an *r*-hyphen; otherwise, the *ge’u-* part would fall off as a cmavo. So this form of the lujvo is “ge’urzdani”.

The last two forms require *y*-hyphens, as all 4-letter rafsi do, and so are “gerkyzda” and “gerkyzdani” respectively.

The scoring algorithm is heavily weighted in favor of short lujvo, so we might expect that “gerzda” would win. Its L score is 6, its A score is 0, its H score is 0, its R score is 12, and its V score is 3, for a final score of 5878. The other forms have scores of 7917, 6367, 9506, 8008, and 10047 respectively. Consequently, this lujvo would probably appear in the dictionary in the form “gerzda”.

For the next example, we will use the tanru “bloti klesi” (“boat class”) presumably referring to the category (rowboat, motorboat, cruise liner) into which a boat falls. We will omit the long rafsi from the process, since lujvo containing long rafsi are almost never preferred by the scoring algorithm when there are short rafsi available.

The rafsi for “bloti” are *-lot-*, *-blo-*, and *-lo’i-*; for “klesi” they are *-kle-* and *-lei-*. Both these gismu are among the handful which have both CVV-form and CCV-form rafsi, so there is an unusual number of possibilities available for a two-part tanru:

lotkle	blokle	lo’ikle
lotlei	blolei	lo’irlei

Only “lo’irlei” requires hyphenation (to avoid confusion with the cmavo sequence “lo’i lei”). All six forms are valid versions of the lujvo, as are the six further forms using long rafsi; however, the scoring algorithm produces the following results:

lotkle	5878
blokle	5858
lo’ikle	6367
lotlei	5867
blolei	5847
lo’irlei	7456

So the form “blolei” is preferred, but only by a tiny margin over “blokle”; the next two forms are only slightly worse; “lo’ikle” suffers because of its apostrophe, and “lo’irlei” because of having both apostrophe and hyphen.

Our third example will result in forming both a lujvo and a name from the tanru “logji bangu girzu”, or “logical-language group” in English. (“The Logical Language Group” is the name of the publisher of this book and the organization for the promotion of Lojban.) The available rafsi are *-loj-* and *-logj-*; *-ban-*, *-bau-*, and *-bang-*; and *-gri-* and *-girzu*, and (for name purposes only) *-gir-* and *-girz-*. The resulting 12 lujvo possibilities are:

and the 12 name possibilities are:  
After hyphenation, we have:

The only fully reduced lujvo forms are “lojbangri” and “lojbaugri”, of which the latter has a slightly lower score: 8827 versus 8796, respectively. However, for the name of the organization,

loj-ban-gri	loj-bau-gri	loj-bang-gri
logj-ban-gri	logj-bau-gri	logj-bang-gri
loj-ban-girzu	loj-bau-girzu	loj-bang-girzu
logj-ban-girzu	logj-bau-girzu	logj-bang-girzu

loj-ban-gir.	loj-bau-gir.	loj-bang-gir.
logj-ban-gir.	logj-bau-gir.	logj-bang-gir.
loj-ban-girz.	loj-bau-girz.	loj-bang-girz.
logj-ban-girz.	logj-bau-girz.	logj-bang-girz.

lojbangri	lojbaugri	lojbangygri
logjybangri	logjybaugri	logjybangygri
lojbangirzu	lojbaugirzu	lojbangygirzu
logjybangirzu	logjybaugirzu	logjybangygirzu

lojbangir.	lojbaugir.	lojbangygir.
logjybangir.	logjybaugir.	logjybangygir.
lojbangirz.	lojbaugirz.	lojbangygirz.
logjybangirz.	logjybaugirz.	logjybangygirz.

we chose to make sure the name of the language was embedded in it, and to use the clearer long-form rafsi for “girzu”, producing “lojbangirz.”

Finally, here is a four-part lujvo with a cmavo in it, based on the tanru “nakni ke cinse ctuca” or “male (sexual teacher)”. The “ke” cmavo ensures the interpretation “teacher of sexuality who is male”, rather than “teacher of male sexuality”. Here are the possible forms of the lujvo, both before and after hyphenation:

nak-kem-cin-ctu	nakykemcinctu
nak-kem-cin-ctuca	nakykemcinctuca
nak-kem-cins-ctu	nakykemcinsyctu
nak-kem-cins-ctuca	nakykemcinsyctuca
nakn-kem-cin-ctu	naknykemcinctu
nakn-kem-cin-ctuca	naknykemcinctuca
nakn-kem-cins-ctu	naknykemcinsyctu
nakn-kem-cins-ctuca	naknykemcinsyctuca

Of these forms, “nakykemcinctu” is the shortest and is preferred by the scoring algorithm. On the whole, however, it might be better to just make a lujvo for “cinse ctuca” (which would be “cinctu”) since the sex of the teacher is rarely important.

If there was a reason to specify “male”, then the simpler tanru “nakni cinctu” (“male sexual-teacher”) would be appropriate. This tanru is actually shorter than the four-part lujvo, since the “ke” required for grouping need not be expressed.

## 4.14 The gismu creation algorithm

The gismu were created through the following process:

1. At least one word was found in each of the six source languages (Chinese, English, Hindi, Spanish, Russian, Arabic) corresponding to the proposed gismu. This word was rendered into Lojban phonetics rather liberally: consonant clusters consisting of a stop and the corresponding fricative were simplified to just the fricative (*tc* became *c*, *dj* became *j*) and non-Lojban vowels were mapped onto Lojban ones. Furthermore, morphological endings were dropped. The same mapping rules were applied to all six languages for the sake of consistency.
2. All possible gismu forms were matched against the six source-language forms. The matches were scored as follows:
  - (a) If three or more letters were the same in the proposed gismu and the source-language word, and appeared in the same order, the score was equal to the number of letters that were the same. Intervening letters, if any, did not matter.
  - (b) If exactly two letters were the same in the proposed gismu and the source-language word, and either the two letters were consecutive in both words, or were separated by a single letter in both words, the score was 2. Letters in reversed order got no score.
  - (c) Otherwise, the score was 0.
3. The scores were divided by the length of the source-language word in its Lojbanized form, and then multiplied by a weighting value specific to each language, reflecting the proportional number of first-language and second-language speakers of the language. (Second-language speakers were reckoned at half their actual numbers.) The weights were chosen to sum to 1.00. The sum of the weighted scores was the total score for the proposed gismu form.
4. Any gismu forms that conflicted with existing gismu were removed. Obviously, being identical with an existing gismu constitutes a conflict. In addition, a proposed gismu that was identical to an existing gismu except for the final vowel was considered a conflict, since two such gismu would have identical 4-letter rafsi.  
 More subtly: If the proposed gismu was identical to an existing gismu except for a single consonant, and the consonant was “too similar” based on the following table, then the proposed gismu was rejected.
5. The gismu form with the highest score usually became the actual gismu. Sometimes a lower-scoring form was used to provide a better rafsi. A few gismu were changed in error as a result of transcription blunders (for example, the gismu “gismu” should have been “gicmu”, but it’s too late to fix it now).

The language weights used to make most of the gismu were as follows, reflecting 1985 number-of-speakers data.

**Definition 4.3**

<i>Chinese</i>	0.36
<i>English</i>	0.21
<i>Hindi</i>	0.16
<i>Spanish</i>	0.11
<i>Russian</i>	0.09
<i>Arabic</i>	0.07

A few gismu were made much later using updated weights:

**Definition 4.4**

<i>Chinese</i>	0.347
<i>Hindi</i>	0.196
<i>English</i>	0.160
<i>Spanish</i>	0.123
<i>Russian</i>	0.089
<i>Arabic</i>	0.085

Note that the stressed vowel of the gismu was considered sufficiently distinctive that two or more gismu may differ only in this vowel; as an extreme example, “bradi”, “bredi”, “bridi”, and “brodi” (but fortunately not “brudi”) are all existing gismu.

## 4.15 Cultural and other non-algorithmic gismu

The following gismu were not made by the gismu creation algorithm. They are, in effect, coined words similar to fu’ivla. They are exceptions to the otherwise mandatory gismu creation algorithm where there was sufficient justification for such exceptions. Except for the small metric prefixes and the assignable predicates beginning *brod-*, they all end in the letter *o*, which is otherwise a rare letter in Lojban gismu.

The following gismu represent concepts that are sufficiently unique to Lojban that they were either coined from combining forms of other gismu, or else made up out of whole cloth. These gismu are thus conceptually similar to *lujvo* even though they are only five letters long; however, unlike *lujvo*, they have *rafsi* assigned to them for use in building more complex *lujvo*. Assigning gismu to these concepts helps to keep the resulting *lujvo* reasonably short.

**Definition 4.5**

<i>broda</i>	1 <sup>st</sup> assignable predicate
<i>brode</i>	2 <sup>nd</sup> assignable predicate
<i>brodi</i>	3 <sup>rd</sup> assignable predicate
<i>brodo</i>	4 <sup>th</sup> assignable predicate
<i>brodu</i>	5 <sup>th</sup> assignable predicate
<i>cmavo</i>	structure word (from “ <i>cmalu valsi</i> ”)
<i>lojbo</i>	Lojbanic (from “ <i>logji bangu</i> ”)
<i>lujvo</i>	compound word (from “ <i>pluja valsi</i> ”)
<i>mekso</i>	Mathematical EXpression

It is important to understand that even though “*cmavo*”, “*lojbo*”, and “*lujvo*” were made up from parts of other gismu, they are now full-fledged gismu used in exactly the same way as all other gismu, both in grammar and in word formation.

The following three groups of gismu represent concepts drawn from the international language of science and mathematics. They are used for concepts that are represented in most languages by a root which is recognized internationally.

**Definition 4.6**

<i>decti</i>	deci	.1	<i>dekto</i>	deka	10
<i>centi</i>	centi	.01	<i>xecto</i>	hecto	100
<i>milti</i>	milli	.001	<i>kilto</i>	kilo	1000
<i>mikri</i>	micro	$1 \times 10^{-6}$	<i>megdo</i>	mega	$1 \times 10^6$
<i>nanvi</i>	nano	$1 \times 10^{-9}$	<i>gigdo</i>	giga	$1 \times 10^9$
<i>picti</i>	pico	$1 \times 10^{-12}$	<i>terto</i>	tera	$1 \times 10^{12}$
<i>femti</i>	femto	$1 \times 10^{-15}$	<i>petso</i>	peta	$1 \times 10^{15}$
<i>xatsi</i>	atto	$1 \times 10^{-18}$	<i>xexso</i>	exa	$1 \times 10^{18}$
<i>zepti</i>	zepto	$1 \times 10^{-21}$	<i>zetro</i>	zetta	$1 \times 10^{21}$
<i>gocti</i>	yocto	$1 \times 10^{-24}$	<i>gotro</i>	yotta	$1 \times 10^{24}$

Other scientific or mathematical terms:

**Definition 4.7**

<i>delno</i>	candela
<i>kelvo</i>	kelvin
<i>molro</i>	mole
<i>radno</i>	radian
<i>sinso</i>	sine
<i>stero</i>	steradian
<i>tanjo</i>	tangent
<i>xampo</i>	ampere

The gismu “sinso” and “tanjo” were only made non-algorithmically because they were identical (having been borrowed from a common source) in all the dictionaries that had translations. The other terms in this group are units in the international metric system; some metric units, however, were made by the ordinary process (usually because they are different in Chinese).

Finally, there are the cultural gismu, which are also borrowed, but by modifying a word from one particular language, instead of using the multi-lingual gismu creation algorithm. Cultural gismu are used for words that have local importance to a particular culture; other cultures or languages may have no word for the concept at all, or may borrow the word from its home culture, just as Lojban does. In such a case, the gismu algorithm, which uses weighted averages, doesn’t accurately represent the frequency of usage of the individual concept. Cultural gismu are not even required to be based on the six major languages.

The six Lojban source languages:

**Definition 4.8**

<i>jungo</i>	Chinese (from “Zhongguo”)
<i>glico</i>	English
<i>xindo</i>	Hindi
<i>spano</i>	Spanish
<i>rusko</i>	Russian
<i>xrabo</i>	Arabic

Seven other widely spoken languages that were on the list of candidates for gismu-making, but weren’t used:

**Definition 4.9**

<i>bengo</i>	Bengali
<i>porto</i>	Portuguese
<i>baxso</i>	Bahasa Melayu/Bahasa Indonesia
<i>ponjo</i>	Japanese (from “Nippon”)
<i>dotco</i>	German (from “Deutsch”)
<i>fraso</i>	French (from “Français”)
<i>xurdo</i>	Urdu <sup>1</sup>

Countries with a large number of speakers of any of the above languages (where the meaning of “large” is dependent on the specific language):

**Definition 4.10**

<i>merko</i>	American
<i>brito</i>	British
<i>skoto</i>	Scottish
<i>sralo</i>	Australian
<i>kadno</i>	Canadian
<i>gento</i>	Argentinian
<i>mexno</i>	Mexican
<i>softo</i>	Russian:
<i>vukro</i>	Soviet/USSR
<i>filso</i>	Ukrainian
<i>jerxo</i>	Palestinian
<i>jordo</i>	Algerian
<i>libjo</i>	Jordanian
<i>lubno</i>	Libyan
<i>misro</i>	Lebanese
<i>morko</i>	Egyptian (from “Mizraim”)
<i>rakso</i>	Moroccan
<i>sadjo</i>	Iraqi
<i>sirxo</i>	Saudi
<i>bindo</i>	Syrian
<i>meljo</i>	Indonesian
<i>brazo</i>	Malaysian
<i>kisto</i>	Brazilian
	Pakistani

The continents (and oceanic regions) of the Earth:

**Definition 4.11**

<i>bemro</i>	North American (from “berti merko”)
<i>dzipo</i>	Antarctican (from “cadzu cipni”)
<i>ketco</i>	South American (from “Quechua”)
<i>friko</i>	African
<i>polno</i>	Polynesian/Oceanic
<i>ropno</i>	European
<i>xazdo</i>	Asiatic

A few smaller but historically important cultures:

**Definition 4.12**

<i>latmo</i>	Latin/Roman
<i>srito</i>	Sanskrit
<i>xebro</i>	Hebrew/Israeli
<i>xelso</i>	Greek (from “Hellas”)

Major world religions:

**Definition 4.13**

<i>budjo</i>	Buddhist
<i>dadjo</i>	Taoist
<i>muslo</i>	Islamic/Moslem
<i>xriso</i>	Christian

A few terms that cover multiple groups of the above:

**Definition 4.14**

<i>jegvo</i>	Jehovist (Judeo-Christian-Moslem)
<i>semto</i>	Semitic
<i>slovo</i>	Slavic
<i>xispo</i>	Hispanic (New World Spanish)

## 4.16 rafsi fu'ivla: a proposal

The list of cultures represented by gismu, given in Section 4.15, is unavoidably controversial. Much time has been spent debating whether this or that culture “deserves a gismu” or “must languish in fu'ivla space”. To help defuse this argument, a last-minute proposal was made when this book was already substantially complete. I have added it here with experimental status: it is not yet a standard part of Lojban, since all its implications have not been tested in open debate, and it affects a part of the language (lujvo-making) that has long been stable, but is known to be fragile in the face of small changes. (Many attempts were made to add general mechanisms for making lujvo that contained fu'ivla, but all failed on obvious or obscure counterexamples; finally the general “zei” mechanism was devised instead.)

The first part of the proposal is uncontroversial and involves no change to the language mechanisms. All valid Type 4 fu'ivla of the form CCVVCV would be reserved for cultural brivla analogous to those described in Section 4.15. For example,

**Example 4.16.1**

tci'ile  
Chilean

is of the appropriate form, and passes all tests required of a Stage 4 fu'ivla. No two fu'ivla of this form would be allowed to coexist if they differed only in the final vowel; this rule was applied to gismu, but does not apply to other fu'ivla or to lujvo.



The second, and fully experimental, part of the proposal is to allow rafsi to be formed from these cultural fu'ivla by removing the final vowel and treating the result as a 4-letter rafsi (although it would contain five letters, not four). These rafsi could then be used on a par with all other rafsi in forming lujvo. The tanru

**Example 4.16.2**

tci'ile ke canre tutra  
 Chilean type-of (sand territory)  
 Chilean desert

could be represented by the lujvo

**Example 4.16.3**

tci'ilykemcantutra

which is an illegal word in standard Lojban, but a valid lujvo under this proposal. There would be no short rafsi or 5-letter rafsi assigned to any fu'ivla, so no fu'ivla could appear as the last element of a lujvo.

The cultural fu'ivla introduced under this proposal are called *rafsi fu'ivla*, since they are distinguished from other Type 4 fu'ivla by the property of having rafsi. If this proposal is workable and introduces no problems into Lojban morphology, it might become standard for all Type 4 fu'ivla, including those made for plants, animals, foodstuffs, and other things.



## Chapter

# 5

# *Pretty Little Girls' School: The Structure of Lojban selbri*



## 5.1 Lojban content words: brivla

At the center, logically and often physically, of every Lojban bridi is one or more words which constitute the selbri. A bridi expresses a relationship between things: the selbri specifies which relationship is referred to. The difference between:

### Example 5.1.1

do mamta mi  
You are-a-mother-of me.  
You are my mother.

and

### Example 5.1.2

do patfu mi  
You are-a-father-of me.  
You are my father.

lies in the different selbri. The simplest kind of selbri is a single Lojban content word: a brivla. There are three different varieties of brivla: those which are built into the language (the gismu), those which are derived from combinations of the gismu (the lujvo), and those which are taken

(usually in a modified form) from other languages (the fu'ivla). In addition, there are a few cmavo that can act like brivla; these are mentioned in Section 5.9, and discussed in full in Chapter 7.

For the purposes of this chapter, however, all brivla are alike. For example,

**Example 5.1.3**

ta bloti  
That is-a-boat.  
That is a boat.

**Example 5.1.4**

ta brablo  
that is-a-large-boat.  
That is a ship.

**Example 5.1.5**

ta blotrskunri  
That is-a-(boat)-schooner.  
That is a schooner.

illustrate the three types of brivla (gismu, lujvo, and fu'ivla respectively), but in each case the selbri is composed of a single word whose meaning can be learned independent of its origins. The remainder of this chapter will mostly use gismu as example brivla, because they are short. However, it is important to keep in mind that wherever a gismu appears, it could be replaced by any other kind of brivla.

## 5.2 Simple tanru

Beyond the single brivla, a selbri may consist of two brivla placed together. When a selbri is built in this way from more than one brivla, it is called a *tanru*, a word with no single English equivalent. The nearest analogue to tanru in English are combinations of two nouns such as “lemon tree”. There is no way to tell just by looking at the phrase “lemon tree” exactly what it refers to, even if you know the meanings of “lemon” and “tree” by themselves. As English-speakers, we must simply know that it refers to “a tree which bears lemons as fruits”. A person who didn't know English very well might think of it as analogous to “brown tree” and wonder, “What kind of tree is lemon-colored?”

In Lojban, tanru are also used for the same purposes as English adjective- noun combinations like “big boy” and adverb-verb combinations like “quickly run”. This is a consequence of Lojban not having any such categories as *noun*, *verb*, *adjective*, or *adverb*. English words belonging to any of these categories are translated by simple brivla in Lojban. Here are some examples of tanru:

**Example 5.2.1**

tu pelnimre tricu  
that-yonder is-a-(lemon tree).  
That is a lemon tree.

**Example 5.2.2**

la djan. barda nanla  
 John is-a-big boy.  
 John is a big boy.

**Example 5.2.3**

mi sutra bajra  
 I quick run.  
 I quickly run/I run quickly.

Note that “*pelnimre*” is a *lujvo* for “lemon”; it is derived from the *gismu* “*pelxu*”, yellow, and “*nimre*”, citrus. Note also that “*sutra*” can mean “fast/quick” or “quickly” depending on its use:

**Example 5.2.4**

mi sutra  
 I am-fast/quick.

shows “*sutra*” used to translate an adjective, whereas in Example 5.2.3 it is translating an adverb. (Another correct translation of Example 5.2.3, however, would be “I am a quick runner”.) There are special Lojban terms for the two components of a *tanru*, derived from the place structure of the word “*tanru*”. The first component is called the *seltau*, and the second component is called the *tertau*.

The most important rule for use in interpreting *tanru* is that the *tertau* carries the primary meaning. A “*pelnimre tricu*” is primarily a tree, and only secondarily is it connected with lemons in some way. For this reason, an alternative translation of Example 5.2.1 would be:

**Example 5.2.5**

That is a lemon type of tree.

This “type of” relationship between the components of a *tanru* is fundamental to the *tanru* concept.

We may also say that the *seltau* modifies the meaning of the *tertau*:

**Example 5.2.6**

That is a tree which is lemon-ish  
 (in the way appropriate to trees)

would be another possible translation of Example 5.2.1. In the same way, a more explicit translation of Example 5.2.2 might be:

**Example 5.2.7**

John is a boy who is big in the way that boys are big.

This “way that boys are big” would be quite different from the way in which elephants are big; big-for-a-boy is small-for-an-elephant.

All *tanru* are ambiguous semantically. Possible translations of:

**Example 5.2.8**

ta klama jubme  
That is-a-goer type-of-table.

include:

That is a table which goes (a wheeled table, perhaps). That is a table owned by one who goes. That is a table used by those who go (a sports doctor's table?). That is a table when it goes (otherwise it is a chair?). In each case the object referred to is a "goer type of table", but the ambiguous "type of" relationship can mean one of many things. A speaker who uses tanru (and pragmatically all speakers must) takes the risk of being misunderstood. Using tanru is convenient because they are short and expressive; the circumlocution required to squeeze out all ambiguity can require too much effort.

No general theory covering the meaning of all possible tanru exists; probably no such theory can exist. However, some regularities obviously do exist:

**Example 5.2.9**

do barda prenu  
You are-a-large person.

**Example 5.2.10**

do cmalu prenu  
You are-a-small person.

are parallel tanru, in the sense that the relationship between "barda" and "prenu" is the same as that between "cmalu" and "prenu". Section 5.14 and Section 5.15 contain a partial listing of some types of tanru, with examples.

## 5.3 Three-part tanru grouping with *bo*

The following cmavo is discussed in this section:

**Definition 5.1**

*bo*            closest scope grouping

*BO*

Consider the English sentence:

**Example 5.3.1**

That's a little girls' school.

What does it mean? Two possible readings are:

**Example 5.3.2**

That's a little school for girls.

**Example 5.3.3**

That's a school for little girls.

This ambiguity is quite different from the simple tanru ambiguity described in Section 5.2. We understand that “girls’ school” means “a school where girls are the students”, and not “a school where girls are the teachers” or “a school which is a girl” (!). Likewise, we understand that “little girl” means “girl who is small”. This is an ambiguity of grouping. Is “girls’ school” to be taken as a unit, with “little” specifying the type of girls’ school? Or is “little girl” to be taken as a unit, specifying the type of school? In English speech, different tones of voice, or exaggerated speech rhythm showing the grouping, are used to make the distinction; English writing usually leaves it unrepresented. Lojban makes no use of tones of voice for any purpose; explicit words are used to do the work. The cmavo “bo” (which belongs to selma’o BO) may be placed between the two brivla which are most closely associated. Therefore, a Lojban translation of Example 5.3.2 would be:

**Example 5.3.4**

ta cmalu nixli bo ckule  
That is-a-small girl - school.

Example 5.3.3 might be translated:

**Example 5.3.5**

ta cmalu bo nixli ckule  
That is-a-small - girl school.

The “bo” is represented in the literal translation by a hyphen because in written English a hyphen is sometimes used for the same purpose: “a big dog-catcher” would be quite different from a “big-dog catcher” (presumably someone who catches only big dogs).

Analysis of Example 5.3.4 and Example 5.3.5 reveals a tanru nested within a tanru. In Example 5.3.4, the main tanru has a seltau of “cmalu” and a tertau of “nixli bo ckule”; the tertau is itself a tanru with “nixli” as the seltau and “ckule” as the tertau. In Example 5.3.5, on the other hand, the seltau is “cmalu bo nixli” (itself a tanru), whereas the tertau is “ckule”. This structure of tanru nested within tanru forms the basis for all the more complex types of selbri that will be explained below.

What about Example 5.3.6? What does it mean?

**Example 5.3.6**

ta cmalu nixli ckule  
That is-a-small girl school.

The rules of Lojban do not leave this sentence ambiguous, as the rules of English do with Example 5.3.1. The choice made by the language designers is to say that Example 5.3.6 means the same as Example 5.3.5. This is true no matter what three brivla are used: the leftmost two are always grouped together. This rule is called the *left-grouping rule*. Left-grouping in seemingly ambiguous structures is quite common — though not universal — in other contexts in Lojban. Another way to express the English meaning of Example 5.3.4 and Example 5.3.5, using parentheses to mark grouping, is:

**Example 5.3.7**

ta cmalu nixli bo ckule  
That is-a-small type-of (girl type-of school).

**Example 5.3.8**

ta cmalu bo nixli ckule  
That is-a-(small type-of girl) type-of school.

Because “type-of” is implicit in the Lojban tanru form, it has no Lojban equivalent. Note: It is perfectly legal, though pointless, to insert “bo” into a simple tanru:

**Example 5.3.9**

ta klama bo jubme  
That is-a goer - table

is a legal Lojban bridi that means exactly the same thing as Example 5.2.8, and is ambiguous in exactly the same ways. The cmavo “bo” serves only to resolve grouping ambiguity: it says nothing about the more basic ambiguity present in all tanru.

## 5.4 Complex tanru grouping

If one element of a tanru can be another tanru, why not both elements?

**Example 5.4.1**

do mutce bo barda gerku bo kavbu  
You are-a-(very type-of large) (dog type-of capturer).  
You are a very large dog-catcher.

In Example 5.4.1, the selbri is a tanru with seltau “mutce bo barda” and tertau “gerku bo kavbu”. It is worth emphasizing once again that this tanru has the same fundamental ambiguity as all other Lojban tanru: the sense in which the “dog type-of capturer” is said to be “very type-of large” is not precisely specified. Presumably it is his body which is large, but theoretically it could be one of his other properties.

We will now justify the title of this chapter by exploring the ramifications of the phrase “pretty little girls’ school”, an expansion of the tanru used in Section 5.3 to four brivla. (Although this example has been used in the Loglan Project almost since the beginning — it first appeared in Quine’s book *Word and Object* (1960) — it is actually a mediocre example because of the ambiguity of English “pretty”; it can mean “beautiful”, the sense intended here, or it can mean “very”. Lojban “melbi” is not subject to this ambiguity: it means only “beautiful”.) Here are four ways to group this phrase:

**Example 5.4.2**

ta melbi cmalu nixli ckule  
That is-a-((pretty type-of little) type-of girl) type-of school.  
That is a school for girls who are beautifully small.

**Example 5.4.3**

ta melbi cmalu nixli bo ckule  
That is-a-(pretty type-of little) (girl type-of school).  
That is a girls’ school which is beautifully small.



**Example 5.4.4**

ta melbi cmalu bo nixli ckule  
 That is-a-(pretty type-of (little type-of girl)) type-of school.  
 That is a school for small girls who are beautiful.

**Example 5.4.5**

ta melbi cmalu bo nixli bo ckule  
 That is-a-pretty type-of (little type-of (girl type-of school)).  
 That is a small school for girls which is beautiful.

Example 5.4.5 uses a construction which has not been seen before: “*cmalu bo nixli bo ckule*”, with two consecutive uses of “*bo*” between *brivla*. The rule for multiple “*bo*” constructions is the opposite of the rule when no “*bo*” is present at all: the last two are grouped together. Not surprisingly, this is called the *right-grouping rule*, and it is associated with every use of “*bo*” in the language. Therefore,

**Example 5.4.6**

ta cmalu bo nixli bo ckule  
 That is-a-little type-of (girl type-of school).

means the same as Example 5.3.4, not Example 5.3.5. This rule may seem peculiar at first, but one of its consequences is that “*bo*” is never necessary between the first two elements of any of the complex *tanru* presented so far: all of Example 5.4.2 through Example 5.4.5 could have “*bo*” inserted between “*melbi*” and “*cmalu*” with no change in meaning.

## 5.5 Complex *tanru* with *ke* and *ke'e*

The following *cmavo* are discussed in this section:

**Definition 5.2**

<i>ke</i>	start grouping	<i>KE</i>
<i>ke'e</i>	end grouping	<i>KEhE</i>

There is, in fact, a fifth grouping of “pretty little girls’ school” that cannot be expressed with the resources explained so far. To handle it, we must introduce the grouping parentheses *cmavo*, “*ke*” and “*ke'e*” (belonging to *selma'o* *KE* and *KEhE* respectively). Any portion of a *selbri* sandwiched between these two *cmavo* is taken to be a single *tanru* component, independently of what is adjacent to it. Thus, Example 5.4.2 can be rewritten in any of the following ways:

**Example 5.5.1**

ta ke melbi cmalu ke'e nixli ckule  
 That is-a-(pretty little) girl school.

**Example 5.5.2**

ta ke ke melbi cmalu ke'e nixli ke'e ckule  
 That is-a-((pretty little) girl) school.

**Example 5.5.3**

ta ke ke ke melbi cmalu ke'e nixli ke'e ckule ke'e  
That is-a-(((pretty little) girl) school).

Even more versions could be created simply by placing any number of “ke” cmavo at the beginning of the selbri, and a like number of “ke’e” cmavo at its end. Obviously, all of these are a waste of breath once the left-grouping rule has been grasped. However, the following is equivalent to Example 5.4.4 and may be easier to understand:

**Example 5.5.4**

ta melbi ke cmalu nixli ke'e ckule  
That is-a-(pretty type-of (little type-of girl)) type-of school.

Likewise, a “ke” and “ke’e” version of Example 5.4.3 would be:

**Example 5.5.5**

ta melbi cmalu ke nixli ckule <ke'e>  
That is-a-(pretty type-of little) (girl type-of school).

The final “ke’e” is given in square brackets here to indicate that it can be elided. It is always possible to elide “ke’e” at the end of the selbri, making Example 5.5.5 as terse as Example 5.4.3. Now how about that fifth grouping? It is

**Example 5.5.6**

ta melbi ke cmalu nixli ckule <ke'e>  
That is-a-pretty type-of ((little type-of girl) type-of school)  
That is a beautiful school for small girls.

Example 5.5.6 is distinctly different in meaning from any of Example 5.4.2 through Example 5.4.5. Note that within the “ke ... ke’e” parentheses, the left-grouping rule is applied to “cmalu nixli ckule”.

It is perfectly all right to mix “bo” and “ke ... ke’e” in a single selbri. For instance, Example 5.4.5, which in pure “ke ... ke’e” form is

**Example 5.5.7**

ta melbi ke cmalu ke nixli ckule <ke'e> <ke'e>  
That is-a-pretty type-of (little type-of (girl type-of school)).

can equivalently be expressed as:

**Example 5.5.8**

ta melbi ke cmalu nixli bo ckule <ke'e>  
That is-a-pretty type-of (little type-of (girl type-of school)).

and in many other different forms as well.

## 5.6 Logical connection within tanru

The following cmavo are discussed in this section:

**Definition 5.3**

<i>je</i>	tanru logical “and”	<i>JA</i>
<i>ja</i>	tanru logical “or”	<i>JA</i>
<i>joi</i>	mixed mass “and”	<i>JOI</i>
<i>gu'e</i>	tanru forethought logical “and”	<i>GUhA</i>
<i>gi</i>	forethought connection separator	<i>GI</i>

Consider the English phrase “big red dog”. How shall this be rendered as a Lojban tanru? The naive attempt:

**Example 5.6.1**

barda xunre gerku  
(big type-of red) type-of dog

will not do, as it means a dog whose redness is big, in whatever way redness might be described as “big”. Nor is

**Example 5.6.2**

barda xunre bo gerku  
big type-of (red type-of dog)

much better. After all, the straightforward understanding of the English phrase is that the dog is big as compared with other dogs, not merely as compared with other red dogs. In fact, the bigness and redness are independent properties of the dog, and only obscure rules of English adjective ordering prevent us from saying “red big dog”.

The Lojban approach to this problem is to introduce the cmavo “je”, which is one of the many equivalents of English “and”. A big red dog is one that is both big and red, and we can say:

**Example 5.6.3**

barda je xunre gerku  
(big and red) type-of dog

Of course,

**Example 5.6.4**

xunre je barda gerku  
(red and big) type-of dog

is equally satisfactory and means the same thing. As these examples indicate, joining two brivla with “je” makes them a unit for tanru purposes. However, explicit grouping with “bo” or “ke ... ke'e” associates brivla more closely than “je” does:

**Example 5.6.5**

barda je pelxu bo xunre gerku  
barda je ke pelxu xunre ke'e gerku  
(big and (yellow type-of red)) dog  
big yellowish-red dog

With no grouping indicators, we get:

**Example 5.6.6**

barda je pelxu xunre gerku  
 ((big and yellow) type-of red) type-of dog  
 biggish- and yellowish-red dog

which again raises the question of Example 5.6.1: what is does “biggish-red” mean?

Unlike “bo” and “ke ... ke’e”, “je” is useful as well as merely legal within simple tanru. It may be used to partly resolve the ambiguity of simple tanru:

**Example 5.6.7**

ta blanu je zdani  
 that is-blue and is-a-house

definitely refers to something which is both blue and is a house, and not to any of the other possible interpretations of simple “blanu zdani”. Furthermore, “blanu zdani” refers to something which is blue in the way that houses are blue; “blanu je zdani” has no such implication — the blueness of a “blanu je zdani” is independent of its houseness.

With the addition of “je”, many more versions of “pretty little girls’ school” are made possible: see Section 5.16 for a complete list.

A subtle point in the semantics of tanru like Example 5.6.3 needs special elucidation. There are at least two possible interpretations of:

**Example 5.6.8**

ta melbi je nixli ckule  
 That is-a- (beautiful and girl) type-of school.

It can be understood as:

**Example 5.6.9**

That is a girls’ school and a beautiful school.

or as:

**Example 5.6.10**

That is a school for things which are both girls and beautiful.

The interpretation specified by Example 5.6.9 treats the tanru as a sort of abbreviation for:

**Example 5.6.11**

ta ke melbi ckule ke’e je ke nixli ckule *<ke’e>*  
 That is-a- (beautiful type-of school) and (girl type-of school)

whereas the interpretation specified by Example 5.6.10 does not. This is a kind of semantic ambiguity for which Lojban does not compel a firm resolution. The way in which the school is said to be of type “beautiful and girl” may entail that it is separately a beautiful school and a girls’ school; but the alternative interpretation, that the members of the school are beautiful and girls, is also possible. Still another interpretation is:

**Example 5.6.12**

That is a school for beautiful things and also for girls.

so while the logical connectives help to resolve the meaning of tanru, they by no means compel a single meaning in and of themselves.

In general, logical connectives within tanru cannot undergo the formal manipulations that are possible with the related logical connectives that exist outside tanru; see Chapter 14 for further details.

The logical connective “je” is only one of the fourteen logical connectives that Lojban provides. Here are a few examples of some of the others:

**Example 5.6.13**

le bajra cu jinga ja te jinga  
the runner(s) is/are winner(s) or loser(s).

**Example 5.6.14**

blanu naja lenku skapi  
(blue only-if cold) skin  
skin which is blue only if it is cold

**Example 5.6.15**

xamgu jo cortu nuntavla  
(good if-and-only-if short) speech  
speech which is good if (and only if) it is short

**Example 5.6.16**

vajni ju pluka nuntavla  
(important whether-or-not pleasing) event-of-talking  
speech which is important, whether or not it is pleasing

In Example 5.6.13, “ja” is grammatically equivalent to “je” but means “or” (more precisely, “and/or”). Likewise, “naja” means “only if” in Example 5.6.14, “jo” means “if and only if” in Example 5.6.15, and “ju” means “whether or not” in Example 5.6.16.

Now consider the following example:

**Example 5.6.17**

ricfu je blanu jabo crino  
rich and (blue or green)

which illustrates a new grammatical feature: the use of both “ja” and “bo” between tanru components. The two cmavo combine to form a compound whose meaning is that of “ja” but which groups more closely; “jabo” is to “ja” as plain “bo” is to no cmavo at all. However, both “ja” and “jabo” group less closely than “bo” does:

**Example 5.6.18**

ricfu je blanu jabo crino bo blanu  
rich and (blue or green - blue)  
rich and (blue or greenish-blue)

An alternative form of Example 5.6.17 is:

**Example 5.6.19**

ricfu je ke blanu ja crino <ke'e>  
rich and (blue or green)

In addition to the logical connectives, there are also a variety of non-logical connectives, grammatically equivalent to the logical ones. The only one with a well-understood meaning in tanru contexts is “joi”, which is the kind of “and” that denotes a mixture:

**Example 5.6.20**

ti blanu joi xunre bolci  
This is-a- (blue and red) ball.

The ball described is neither solely red nor solely blue, but probably striped or in some other way exhibiting a combination of the two colors. Example 5.6.20 is distinct from:

**Example 5.6.21**

ti blanu xunre bolci  
This is a bluish-red ball

which would be a ball whose color is some sort of purple tending toward red, since “xunre” is the more important of the two components. On the other hand,

**Example 5.6.22**

ti blanu je xunre bolci  
This is a (blue and red) ball

is probably self-contradictory, seeming to claim that the ball is independently both blu and red at the same time, although some sensible interpretation may exist.

Finally, just as English “and” has the variant form “both ... and”, so “je” between tanru components has the variant form “gu'e ... gi”, where “gu'e” is placed before the components and “gi” between them:

**Example 5.6.23**

gu'e barda gi xunre gerku  
(both big and red) type-of dog

is equivalent in meaning to Example 5.6.3. For each logical connective related to “je”, there is a corresponding connective related to “gu'e ... gi” in a systematic way.

The portion of a “gu'e ... gi” construction before the “gi” is a full selbri, and may use any of the selbri resources including “je” logical connections. After the “gi”, logical connections are taken to be wider in scope than the “gu'e ... gi”, which has in effect the same scope as “bo”:

**Example 5.6.24**

gu'e barda je xunre gi gerku ja mlatu  
(both (big and red) and dog) or cat  
something which is either big, red, and a dog, or else a cat

leaves “mlatu” outside the “gu'e ... gi” construction. The scope of the “gi” arm extends only to a single brivla or to two or more brivla connected with “bo” or “ke ... ke'e”.

## 5.7 Linked sumti: *be ... bei ... be'o*

The following cmavo are discussed in this section:

### Definition 5.4

<i>be</i>	linked sumti marker	<i>BE</i>
<i>bei</i>	linked sumti separator	<i>BEI</i>
<i>be'o</i>	linked sumti terminator	<i>BEhO</i>

The question of the place structures of selbri has been glossed over so far. This chapter does not attempt to treat place structure issues in detail; they are discussed in Chapter 9. One grammatical structure related to places belongs here, however. In simple sentences such as Example 5.1.1, the place structure of the selbri is simply the defined place structure of the gismu “mamta”. What about more complex selbri?

For tanru, the place structure rule is simple: the place structure of a tanru is always the place structure of its tertau. Thus, the place structure of “blanu zdani” is that of “zdani”: the  $x_1$  place is a house or nest, and the  $x_2$  place is its occupants.

What about the places of “blanu”? Is there any way to get them into the act? In fact, “blanu” has only one place, and this is merged, as it were, with the  $x_1$  place of “zdani”. It is whatever is in the  $x_1$  place that is being characterized as blue-for-a-house. But if we replace “blanu” with “xamgu”, we get:

### Example 5.7.1

ti xamgu zdani  
 this is-a-good house.  
 This is a good (for someone, by some standard) house.

Since “xamgu” has three places ( $x_1$ , the good thing;  $x_2$ , the person for whom it is good; and  $x_3$ , the standard of goodness), Example 5.7.1 necessarily omits information about the last two: there is no room for them. Room can be made, however!

### Example 5.7.2

ti xamgu be do bei mi ⟨*be'o*⟩ zdani  
 this is-a-good (for you by-standard me) house.  
 This is a house that is good for you by my standards.

Here, the gismu “xamgu” has been followed by the cmavo “be” (of selma'o BE), which signals that one or more sumti follows. These sumti are not part of the overall bridi place structure, but fill the places of the brivla they are attached to, starting with  $x_2$ . If there is more than one sumti, they are separated by the cmavo “bei” (of selma'o BEI), and the list of sumti is terminated by the elidable terminator “be'o” (of selma'o BEhO).

Grammatically, a brivla with sumti linked to it in this fashion plays the same role in tanru as a simple brivla. To illustrate, here is a fully fleshed-out version of Example 5.3.4, with all places filled in:

### Example 5.7.3

ti cmalu be le ka canlu bei lo'e ckule be'o  
 nixli be li mu bei lo merko be'o bo  
 ckule la bryklyn. loi pemci le mela nu,IORK. prenu le jecta

This is a small (in-dimension the property-of volume by-standard the-typical school) (girl (of-years the-number five by-standard some American-thing) school) in-Brooklyn with-subject poems for-audience New-York persons with-operator the state.

This is a school, small in volume compared to the typical school, pertaining to five-year-old girls (by American standards), in Brooklyn, teaching poetry to the New York community and operated by the state.

Here the three places of “cmalu”, the three of “nixli”, and the four of “ckule” are fully specified. Since the places of “ckule” are the places of the bridi as a whole, it was not necessary to link the sumti which follow “ckule”. It would have been legal to do so, however:

**Example 5.7.4**

mi klama be le zarci bei le zdani *<be'o>*  
I go (to-the market from-the house).

means the same as

**Example 5.7.5**

mi klama le zarci le zdani  
I go to-the market from-the house.

No matter how complex a tanru gets, the last brivla always dictates the place structure: the place structure of

**Example 5.7.6**

melbi je cmalu nixli bo ckule  
a (pretty and little) (girl school)  
a school for girls which is both beautiful and small

is simply that of “ckule”. (The sole exception to this rule is discussed in Section 5.8.)

It is possible to precede linked sumti by the place structure ordering tags “fe”, “fi”, “fo”, and “fu” (of selma'o FA, discussed further in Chapter 9), which serve to explicitly specify the  $x_2$ ,  $x_3$ ,  $x_4$ , and  $x_5$  places respectively. Normally, the place following the “be” is the  $x_2$  place and the other places follow in order. If it seems convenient to change the order, however, it can be accomplished as follows:

**Example 5.7.7**

ti xamgu be fi mi bei fe do *<be'o>* zdani  
this is-a-good (by-standard me for you) house

which is equivalent in meaning to Example 5.7.2. Note that the order of “be”, “bei”, and “be'o” does not change; only the inserted “fi” tells us that “mi” is the  $x_3$  place (and correspondingly, the inserted “fe” tells us that “do” is the  $x_2$  place). Changing the order of sumti is often done to match the order of another language, or for emphasis or rhythm. Of course, using FA cmavo makes it easy to specify one place while omitting a previous place:



**Example 5.7.8**

ti xangu be fi mi ⟨*be'o*⟩ zdani  
 this is-a-good (by-standard me) house  
 This is a good house by my standards.

Similarly, sumti labeled by modal or tense tags can be inserted into strings of linked sumti just as they can into bridj:

**Example 5.7.9**

ta blanu be ga'a mi ⟨*be'o*⟩ zdani  
 That is-a-blue (to-observer me) house.  
 That is a blue, as I see it, house.

The meaning of Example 5.7.9 is slightly different from:

**Example 5.7.10**

ta blanu zdani ga'a mi  
 That is-a-blue house to-observer me.  
 That is a blue house, as I see it.

See discussions in Chapter 9 of modals and in Chapter 10 of tenses for more explanations.

The terminator “*be'o*” is almost always elidable: however, if the selbri belongs to a description, then a relative clause following it will attach to the last linked sumti unless “*be'o*” is used, in which case it will attach to the outer description:

**Example 5.7.11**

le xangu be do noi barda cu zdani  
 The good-thing for you (who are-large) is-a-house.

**Example 5.7.12**

le xangu be do be'o noi barda cu zdani  
 The (good-thing for you) (which is-large) is-a-house

(Relative clauses are explained in Chapter 8.) In other cases, however, “*be'o*” cannot be elided if “*ku*” has also been elided:

**Example 5.7.13**

le xangu be le ctuca ⟨*ku*⟩ be'o zdani  
 the good (for the teacher) house

requires either “*ku*” or “*be'o*”, and since there is only one occurrence of “*be*”, the “*be'o*” must match it, whereas it may be confusing which occurrence of “*le*” the “*ku*” terminates (in fact the second one is correct).

## 5.8 Inversion of tanru: *co*

The following cmavo is discussed in this section:

<b>Definition 5.5</b>		
<i>co</i>	tanru inversion marker	<i>CO</i>

The standard order of Lojban tanru, whereby the modifier precedes what it modifies, is very natural to English-speakers: we talk of “blue houses”, not of “houses blue”. In other languages, however, such matters are differently arranged, and Lojban supports this reverse order (tertau before seltau) by inserting the particle “*co*”. Example 5.8.1 and Example 5.8.2 mean exactly the same thing:

<b>Example 5.8.1</b>
ta blanu zdani That is-a-blue type-of-house. That is a blue house.

<b>Example 5.8.2</b>
ta zdani co blanu That is-a-house of-type blue. That is a blue house.

This change is called *tanru inversion*. In tanru inversion, the element before “*co*” (“*zdani*” in Example 5.8.2) is the tertau, and the element following “*co*” (“*blanu*”) in Example 5.8.2) is the seltau. The meaning, and more specifically, the place structure, of a tanru is not affected by inversion: the place structure of “*zdani co blanu*” is still that of “*zdani*”. However, the existence of inversion in a selbri has a very special effect on any sumti which follow that selbri. Instead of being interpreted as filling places of the selbri, they actually fill the places (starting with  $x_2$ ) of the seltau. In Section 5.7, we saw how to fill interior places with “*be ... bei ... be'o*”, and in fact Example 5.8.3 and Example 5.8.4 have the same meaning:

<b>Example 5.8.3</b>
mi klama be le zarci bei le zdani be'o troci I am-a-(goer to the market from the house) type-of trier. I try to go to the market from the house.

<b>Example 5.8.4</b>
mi troci co klama le zarci le zdani I am-a-trier of-type (goer to-the market from-the house). I try to go to the market from the house.

Example 5.8.4 is a less deeply nested construction, requiring fewer cmavo. As a result it is probably easier to understand. Note that in Lojban “trying to go” is expressed using “*troci*” as the tertau. The reason is that “trying to go” is a “going type of trying”, not a “trying type of going”. The trying is more fundamental than the going — if the attempt fails, we may not have a going at all.

Any sumti which precede a selbri with an inverted tanru fill the places of the selbri (i.e., the places of the tertau) in the ordinary way. In Example 5.8.4, “*mi*” fills the  $x_1$  place of “*troci co klama*”, which is the  $x_1$  place of “*troci*”. The other places of the selbri remain unfilled. The trailing sumti “*le zarci*” and “*le zdani*” do not occupy selbri places, despite appearances.

As a result, the regular mechanisms (involving selma'o VOhA and GOhI, explained in Chapter 7) for referring to individual sumti of a bridji cannot refer to any of the trailing places of Example 5.8.4, because they are not really “sumti of the bridji” at all.

When inverting a more complex tanru, it is possible to invert it only at the most general modifier-modified pair. The only possible inversion of Example 5.3.4, for instance, is:

**Example 5.8.5**

ta nixli <bo> ckule co cmalu  
 that (is-a-girl type-of school) of-type little.  
 That's a girls' school which is small.

Note that the “bo” of Example 5.3.4 is optional in Example 5.8.5, because “co” groups more loosely than any other cmavo used in tanru, including none at all. Not even “ke ... ke'e” parentheses can encompass a “co”:

**Example 5.8.6**

ta cmalu ke nixli ckule <ke'e> co melbi  
 that is-a-(little type-of (girl type-of school)) of-type pretty.  
 That's a small school for girls which is beautiful.

In Example 5.8.6, the “ke'e” is automatically inserted before the “co” rather than at its usual place at the end of the selbri. As a result, there is a simple and mechanical rule for removing “co” from any selbri: change “A co B” to “ke B ke'e A”. (At the same time, any sumti following the selbri must be transformed into “be ... bei ... be'o” form and attached following B.) Therefore,

**Example 5.8.7**

ckule co melbi nixli  
 school of-type pretty girl  
 school for beautiful girls

means the same as:

**Example 5.8.8**

ke melbi nixli ke'e ckule  
 (pretty girl) school

Multiple “co” cmavo can appear within a selbri, indicating multiple inversions: a right-grouping rule is employed, as for “bo”. The above rule can be applied to interpret such selbri, but all “co” cmavo must be removed simultaneously:

**Example 5.8.9**

ckule co nixli co cmalu  
 school of-type (girl of-type little)

becomes formally

**Example 5.8.10**

ke ke cmalu ke'e nixli ke'e ckule  
 ((little) girl) school

which by the left-grouping rule is simply

**Example 5.8.11**

cmalu nixli ckule  
 little girl school  
 school for little girls

As stated above, the selbri places, other than the first, of

**Example 5.8.12**

mi klama co sutra  
 I am-a-goer of-type quick  
 I go quickly

cannot be filled by placing sumti after the selbri, because any sumti in that position fill the places of “sutra”, the seltau. However, the tertau places (which means in effect the selbri places) can be filled with “be”:

**Example 5.8.13**

mi klama be le zarci co sutra  
 I am-a-goer (to the store) of-type quick.  
 I go to the store quickly.

## 5.9 Other kinds of simple selbri

The following cmavo are discussed in this section:

**Definition 5.6**

<i>go'i</i>	repeats the previous bridi	<i>GOhA</i>
<i>du</i>	equality	<i>GOhA</i>
<i>nu'a</i>	math operator to selbri	<i>NUhA</i>
<i>moi</i>	changes number to ordinal selbri	<i>MOI</i>
<i>mei</i>	changes number to cardinal selbri	<i>MOI</i>
<i>nu</i>	event abstraction	<i>NU</i>
<i>kei</i>	terminator for “nu”	<i>KEI</i>

So far we have only discussed brivla and tanru built up from brivla as possible selbri. In fact, there are a few other constructions in Lojban which are grammatically equivalent to brivla: they can be used either directly as selbri, or as components in tanru. Some of these types of simple selbri are discussed at length in Chapter 7, Chapter 11, and Chapter 18; but for completeness these types are mentioned here with a brief explanation and an example of their use in selbri.

The cmavo of selma'o GOhA (with one exception) serve as pro-bridi, providing a reference to the content of other bridi; none of them has a fixed meaning. The most commonly used member of GOhA is probably “go'i”, which amounts to a repetition of the previous bridi, or part of it. If I say:

**Example 5.9.1**

la djan. klama le zarci  
 John goes-to the market.

you may retort:

**Example 5.9.2**

la djan. go'i troci  
John *<repeat last>* are-a-tryer  
John tries to.

Example 5.9.2 is short for:

**Example 5.9.3**

la djan. klama be le zarci be'o troci  
John is-a-goer (to the market) type-of trier.

because the whole bridi of Example 5.9.1 has been packaged up into the single word “go'i” and inserted into Example 5.9.2. The exceptional member of GOhA is “du”, which represents the relation of identity. Its place structure is:  $x_1$  is identical with  $x_2, x_3, \dots$ , for as many places as are given. More information on selma'o GOhA is available in Chapter 7.

Lojban mathematical expressions (mekso) can be incorporated into selbri in two different ways. Mathematical operators such as “su'i”, meaning “plus”, can be transformed into selbri by prefixing them with “nu'a” (of selma'o NUhA). The resulting place structure is:  $x_1$  is the result of applying (the operator) to arguments  $x_2, x_3, \dots$ , for as many arguments as are required. (The result goes in the  $x_1$  place because the number of following places may be indefinite.) For example:

**Example 5.9.4**

li vo nu'a su'i li re li re  
The-number 4 is-the-sum-of the-number 2 and-the-number 2.

A possible tanru example might be:

**Example 5.9.5**

mi jimpe tu'a nu'a su'i nabmi  
I understand something-about the-mass-of is-the-sum-of problems.  
I understand addition problems.

More usefully, it is possible to combine a mathematical expression with a cmavo of selma'o MOI to create one of various numerical selbri. Details are available in Chapter 18. Here are a few tanru:

**Example 5.9.6**

la prim. palvr. pamoi cusku  
Preem Palver is-the-1-th speaker.  
Preem Palver is the first speaker.

**Example 5.9.7**

la an,iis. joi la .asun. bruna remei  
Anyi massed-with Asun are-a-brother type-of-twosome.  
Anyi and Asun are two brothers.

Finally, an important type of simple selbri which is not a brivla is the abstraction. Grammatically, abstractions are simple: a cmavo of selma'o NU, followed by a bridi, followed by the elidable terminator "kei" of selma'o KEI. Semantically, abstractions are an extremely subtle and powerful feature of Lojban whose full ramifications are documented in Chapter 11. A few examples:

**Example 5.9.8**

ti nu zdile kei kumfa  
This is-an-event-of amusement room.  
This is an amusement room.

Example 5.9.8 is quite distinct in meaning from:

**Example 5.9.9**

ti zdile kumfa  
This is-an-amuser room.

which suggests the meaning "a room that amuses someone".

## 5.10 selbri based on sumti: *me*

The following cmavo are discussed in this section:

**Definition 5.7**

<i>me</i>	changes sumti to simple selbri	<i>ME</i>
<i>me'u</i>	terminator for "me"	<i>MEhU</i>

A sumti can be made into a simple selbri by preceding it with "me" (of selma'o ME) and following it with the elidable terminator "me'u" (of selma'o MEhU). This makes a selbri with the place structure:  $x_1$  is one of the referents of "[the sumti]", which is true of the thing, or things, that are the referents of the sumti, and not of anything else. For example, consider the sumti

**Example 5.10.1**

le ci nolraitru  
the three noblest-governors  
the three kings

If these are understood to be the Three Kings of Christian tradition, who arrive every year on January 6, then we may say:

**Example 5.10.2**

la BALtazar. cu me le ci nolraitru  
Balthazar is one-of-the-referents-of "the three kings".  
Balthazar is one of the three kings.

and likewise

**Example 5.10.3**

la kaspar. cu me le ci nolraitru  
 Caspar is one of the three kings.

and

**Example 5.10.4**

la melxi,or. cu me le ci nolraitru  
 Melchior is one of the three kings.

If the sumti refers to a single object, then the effect of “me” is much like that of “du”:

**Example 5.10.5**

do du la djan.  
 You are-identical-with the-one-called “John”.  
 You are John.

means the same as

**Example 5.10.6**

do me la djan.  
 You are-the-referent-of “the-one-called “John””.  
 You are John.

It is common to use “me” selbri, especially those based on name sumti using “la”, as seltau. For example:

**Example 5.10.7**

ta me lai kraislr. <me'u> karce  
 That (is-a-referent of “the-mass-called “Chrysler””) car.  
 That is a Chrysler car.

The elidable terminator “me’u” can usually be omitted. It is absolutely required only if the “me” selbri is being used in an indefinite description (a type of sumti explained in Chapter 6), and if the indefinite description is followed by a relative clause (explained in Chapter 8) or a sumti logical connective (explained in Chapter 14). Without a “me’u”, the relative clause or logical connective would appear to belong to the sumti embedded in the “me” expression. Here is a contrasting pair of sentences:

**Example 5.10.8**

re me le ci nolraitru .e la djan. <me'u> cu blabi  
 Two of the group “the three kings and John” are white.

**Example 5.10.9**

re me le ci nolraitru me'u .e la djan. cu blabi  
 Two of the three kings, and John, are white.

In Example 5.10.8 the “me” selbri covers the three kings plus John, and the indefinite description picks out two of them that are said to be white: we cannot say which two. In Example

5.10.9, though, the “me” selbri covers only the three kings: two of them are said to be white, and so is John.

Finally, here is another example requiring “me’u”:

**Example 5.10.10**

ta me la’e le se cusku be do me’u cukta  
That is-a-(what-you-said) type of book.  
That is the kind of book you were talking about.

There are other sentences where either “me’u” or some other elidable terminator must be expressed:

**Example 5.10.11**

le me le ci nolraitru  $\langle ku \rangle$  me’u nunsalci  
the (the three kings) type-of-event-of-celebrating  
the Three Kings celebration

requires either “ku” or “me’u” to be explicit, and (as with “be’o” in Section 5.7) the “me’u” leaves no doubt which cmavo it is paired with.

## 5.11 Conversion of simple selbri

Conversion is the process of changing a selbri so that its places appear in a different order. This is not the same as labeling the sumti with the cmavo of FA, as mentioned in Section 5.7, and then rearranging the order in which the sumti are spoken or written. Conversion transforms the selbri into a distinct, though closely related, selbri with renumbered places.

In Lojban, conversion is accomplished by placing a cmavo of selma’o SE before the selbri:

**Example 5.11.1**

mi prami do  
I love you.

is equivalent in meaning to:

**Example 5.11.2**

do se prami mi  
You  $\langle \text{swap } x_1 \text{ and } x_2 \rangle$  love me.  
You are loved by me.

Conversion is fully explained in Chapter 9. For the purposes of this chapter, the important point about conversion is that it applies only to the following simple selbri. When trying to convert a tanru, therefore, it is necessary to be careful! Consider Example 5.11.3:

**Example 5.11.3**

la .alis. cu cadzu klama le zarci  
Alice is-a-walker type-of goer to-the market.  
Alice walkingly goes to the market.  
Alice walks to the market.



To convert this sentence so that “le zarci” is in the  $x_1$  place, one correct way is:

**Example 5.11.4**

le zarci cu se ke cadzu klama  $\langle ke'e \rangle$  la .alis.  
 The market is-a- $\langle swap\ x_1/x_2 \rangle$  (walker type-of goer) Alice.  
 The market is-walkingly gone-to by-Alice.

The “ke ... ke'e” brackets cause the entire tanru to be converted by the “se”, which would otherwise convert only “cadzu”, leading to:

**Example 5.11.5**

le zarci cu se cadzu klama la .alis.  
 The market (is-a- $\langle swap\ x_1/x_2 \rangle$  walker) type-of goer to Alice.  
 The market is-a-walking-surface type-of goer to Alice.

whatever that might mean. An alternative approach, since the place structure of “cadzu klama” is that of “klama” alone, is to convert only the latter:

**Example 5.11.6**

le zarci cu cadzu se klama la .alis.  
 The market walkingly is-gone-to by-Alice.

But the tanru in Example 5.11.6 may or may not have the same meaning as that in Example 5.11.3; in particular, because “cadzu” is not converted, there is a suggestion that although Alice is the goer, the market is the walker. With a different sumti as  $x_1$ , this seemingly odd interpretation might make considerable sense:

**Example 5.11.7**

la djan. cu cadzu se klama la .alis  
 John walkingly is-gone-to by Alice

suggests that Alice is going to John, who is a moving target.

There is an alternative type of conversion, using the cmavo “jai” of selma'o JAI optionally followed by a modal or tense construction. Grammatically, such a combination behaves exactly like conversion using SE. More details can be found in Chapter 9.

## 5.12 Scalar negation of selbri

Negation is too large and complex a topic to explain fully in this chapter; see Chapter 15. In brief, there are two main types of negation in Lojban. This section is concerned with so-called *scalar negation*, which is used to state that a true relation between the sumti is something other than what the selbri specifies. Scalar negation is expressed by cmavo of selma'o NAhE:

**Example 5.12.1**

la .alis. cu na'e ke cadzu klama  $\langle ke'e \rangle$  le zarci  
 Alice non- (walkingly goes) to-the market.  
 Alice other-than (walkingly goes) to-the market.  
 Alice doesn't walk to the market.

meaning that Alice’s relationship to the market is something other than that of walking there. But if the “ke” were omitted, the result would be:

**Example 5.12.2**

la .alis. cu na’e cadzu klama le zarci  
 Alice non- walkingly goes to-the market.  
 Alice doesn’t walk to the market.

meaning that Alice does go there in some way (“klama” is not negated), but by a means other than that of walking. Example 5.12.1 negates both “cadzu” and “klama”, suggesting that Alice’s relation to the market is something different from walkingly-going; it might be walking without going, or going without walking, or neither.

Of course, any of the simple selbri types explained in Section 5.9 may be used in place of brivla in any of these examples:

**Example 5.12.3**

la djonz. cu na’e pamoi cusku  
 Jones is non-1<sup>st</sup> speaker  
 Jones is not the first speaker.

Since only “pamoi” is negated, an appropriate inference is that he is some other kind of speaker.

Here is an assortment of more complex examples showing the interaction of scalar negation with “bo” grouping, “ke” and “ke’e” grouping, logical connection, and sumti linked with “be” and “bei”:

**Example 5.12.4**

mi na’e sutra cadzu be fi le birka be’o klama le zarci  
 I ((non-quickly) (walking using the arms)) go-to the market.  
 I go to the market, walking using my arms other than quickly.

In Example 5.12.4, “na’e” negates only “sutra”. Contrast Example 5.12.5:

**Example 5.12.5**

mi na’e ke sutra cadzu be fi le birka <be’o> ke’e klama le zarci  
 I non- (quickly (walking using the arms)) go-to the market.  
 I go to the market, other than by walking quickly on my arms.

Now consider Example 5.12.6 and Example 5.12.7, which are equivalent in meaning, but use “ke” grouping and “bo” grouping respectively:

**Example 5.12.6**

mi sutra cadzu be fi le birka be’o je masno klama le zarci  
 I (quickly - (walking using the arms) and slowly) go-to the market.  
 I go to the market, both quickly walking using my arms and slowly.

**Example 5.12.7**

mi ke sutra cadzu be fi le birka <be’o> ke’e je masno klama le zarci  
 I ((quickly (walking using the arms)) and slowly) go-to the market.  
 I go to the market, both quickly walking using my arms and slowly.

However, if we place a “na’e” at the beginning of the selbri in both Example 5.12.6 and Example 5.12.7, we get different results:

**Example 5.12.8**

mi na’e sutra cadzu be fi le birka be’o je masno klama le zarci  
 I ((non- quickly) - (walking using the arms) and slowly) go-to the market.  
 I go to the market, both walking using my arms other than quickly, and also slowly.

**Example 5.12.9**

mi na’e ke sutra cadzu be fi le birka ⟨be’o⟩ ke’e je masno klama le zarci  
 I (non-(quickly (walking using the arms)) and slowly) go-to the market.  
 I go to the market, both other than quickly walking using my arms, and also slowly.

The difference arises because the “na’e” in Example 5.12.9 negates the whole construction from “ke” to “ke’e”, whereas in Example 5.12.8 it negates “sutra” alone.

Beware of omitting terminators in these complex examples! If the explicit “ke’e” is left out in Example 5.12.9, it is transformed into:

**Example 5.12.10**

mi na’e ke sutra cadzu be fi le birka be’o je masno klama ⟨ke’e⟩ le zarci  
 I non-(quickly ((walking using the arms)) and slowly) go-to) the market.  
 I do something other than quickly both going to the market walking using my arms and slowly going to the market.

And if both “ke’e” and “be’o” are omitted, the results are even sillier:

**Example 5.12.11**

mi na’e ke sutra cadzu be fi le birka je masno klama ⟨be’o⟩ ⟨ke’e⟩ le zarci  
 I non-(quickly walk on my (arm-type and slow) goers) on the market.  
 I do something other than quickly walking using the goers, both arm-type and slow, relative-to the market.

In Example 5.12.11, everything after “be” is a linked sumti, so the place structure is that of “cadzu”, whose  $x_2$  place is the surface walked upon. It is less than clear what an “arm-type goer” might be. Furthermore, since the  $x_3$  place has been occupied by the linked sumti, the “le zarci” following the selbri falls into the nonexistent  $x_4$  place of “cadzu”. As a result, the whole example, though grammatical, is complete nonsense. (The bracketed Lojban words appear where a fluent Lojbanist would understand them to be implied.)

Finally, it is also possible to place “na’e” before a “gu’e ... gi” logically connected tanru construction. The meaning of this usage has not yet been firmly established.

## 5.13 Tenses and bridri negation

A bridri can have cmavo associated with it which specify the time, place, or mode of action. For example, in

**Example 5.13.1**

mi pu klama le zarci  
 I *<past>* go to-the market.  
 I went to the market.

the cmavo “pu” specifies that the action of the speaker going to the market takes place in the past. Tenses are explained in full detail in Chapter 10. Tense is semantically a property of the entire bridi; however, the usual syntax for tenses attaches them at the front of the selbri, as in Example 5.13.1. There are alternative ways of expressing tense information as well. Modals, which are explained in Chapter 9, behave in the same way as tenses.

Similarly, a bridi may have the particle “na” (of selma’o NA) attached to the beginning of the selbri to negate the bridi. A negated bridi expresses what is false without saying anything about what is true. Do not confuse this usage with the scalar negation of Section 5.12. For example:

**Example 5.13.2**

la djonz. na pamoi cusku  
 Jones (Not!) is-the-first speaker  
 It is not true that Jones is the first speaker.  
 Jones isn’t the first speaker.

Jones may be the second speaker, or not a speaker at all; Example 5.13.2 doesn’t say. There are other ways of expressing bridi negation as well; the topic is explained fully in Chapter 15.

Various combinations of tense and bridi negation cmavo are permitted. If both are expressed, either order is permissible with no change in meaning:

**Example 5.13.3**

mi na pu klama le zarci  
 mi pu na klama le zarci  
 It is false that I went to the market.  
 I didn’t go to the market.

It is also possible to have more than one “na”, in which case pairs of “na” cmavo cancel out:

**Example 5.13.4**

mi na na klama le zarci  
 It is false that it is false that I go to the market.  
 I go to the market.

It is even possible, though somewhat pointless, to have multiple “na” cmavo and tense cmavo mixed together, subject to the limitation that two adjacent tense cmavo will be understood as a compound tense, and must fit the grammar of tenses as explained in Chapter 10.

**Example 5.13.5**

mi na pu na ca klama le zarci  
 I *<not>* *<past>* *<not>* *<present>* go to-the market  
 It is not the case that in the past it was not the case that in the present I went to the market.  
 I didn’t not go to the market.  
 I went to the market.

Tense, modal, and negation *cmavo* can appear only at the beginning of the *selbri*. They cannot be embedded within it.

## 5.14 Some types of asymmetrical *tanru*

This section and Section 5.15 contain some example *tanru* classified into groups based on the type of relationship between the modifying *seltau* and the modified *tertau*. All the examples are paralleled by compounds actually observed in various natural languages. In the tables which follow, each group is preceded by a brief explanation of the relationship. The tables themselves contain a *tanru*, a literal gloss, an indication of the languages which exhibit a compound analogous to this *tanru*, and (for those *tanru* with no English parallel) a translation.

Here are the 3-letter abbreviations used for the various languages (it is presumed to be obvious whether a compound is found in English or not, so English is not explicitly noted):

### Definition 5.8

<i>Aba</i>	Abazin
<i>Chi</i>	Chinese
<i>Eng</i>	English
<i>Ewe</i>	Ewe
<i>Fin</i>	Finnish
<i>Geo</i>	Georgian
<i>Gua</i>	Guaran
<i>Hop</i>	Hopi
<i>Hun</i>	Hungarian
<i>Imb</i>	Imbabura Quechua
<i>Kar</i>	Karaitic
<i>Kaz</i>	Kazakh
<i>Kor</i>	Korean
<i>Mon</i>	Mongolian
<i>Qab</i>	Qabardian
<i>Que</i>	Quechua
<i>Rus</i>	Russian
<i>Skt</i>	Sanskrit
<i>Swe</i>	Swedish
<i>Tur</i>	Turkish
<i>Udm</i>	Udmurt

The *tanru* discussed in this section are asymmetrical *tanru*; that is, ones in which the order of the terms is fundamental to the meaning of the *tanru*. For example, “*junla dadylsi*”, or “clock pendulum”, is the kind of pendulum used in a clock, whereas “*dadylsi junla*”, or “pendulum clock”, is the kind of clock that employs a pendulum. Most *tanru* are asymmetrical in this sense. Symmetrical *tanru* are discussed in Section 5.15.

The *tertau* represents an action, and the *seltau* then represents the object of that action:

### Definition 5.9

<i>pinsi kilbra</i> <sup>1</sup>	pencil sharpener	Hun
<i>zgike nunctu</i> <sup>2</sup>	music instruction	Hun

<i>mirli nunkalte</i> <sup>3</sup>	deer hunting	Hun
<i>finpe nunkalte</i>	fish hunting	Tur, Kor, Udm, Aba = fishing
<i>smacu terkavbu</i> <sup>4</sup>	mousetrap	Tur, Kor, Hun, Udm, Aba
<i>zdani turni</i>	house ruler	Kar = host
<i>zerle'a</i> <sup>5</sup> <i>nunte'a</i> <sup>6</sup>	thief fear	Skt = fear of thieves
<i>ceveni zekri</i>	god crime	Skt = offense against the gods

The tertau represents a set, and the seltau the type of the elements contained in that set:

<b>Definition 5.10</b>		
<i>zdani lijgri</i> <sup>1</sup>	house row	Eng
<i>selci lamgri</i> <sup>2</sup>	cell block	Eng
<i>karda mulgri</i> <sup>3</sup>	card pack	Swe
<i>rokci derxi</i>	stone heap	Swe
<i>tadni girzu</i>	student group	Hun
<i>remna girzu</i>	human-being group	Qab = group of people
<i>cpumi'i</i> <sup>4</sup> <i>lijgri</i>	tractor column	Qab
<i>ceveni jenmi</i>	god army	Skt
<i>ceveni prenu</i>	god folk	Skt

Conversely: the tertau is an element, and the seltau represents a set in which that element is contained. Implicitly, the meaning of the tertau is restricted from its usual general meaning to the specific meaning appropriate for elements in the given set. Note the opposition between “*zdani linji*” in the previous group, and “*linji zdani*” in this one, which shows why this kind of tanru is called *asymmetrical*.

<b>Definition 5.11</b>		
<i>carvi dirgo</i>	raindrop	Tur, Kor, Hun, Udm, Aba
<i>linji zdani</i>	row house	Eng

The seltau specifies an object and the tertau a component or detail of that object; the tanru as a whole refers to the detail, specifying that it is a detail of that whole and not some other.

<b>Definition 5.12</b>
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<sup>1</sup>sharp-appartus  
<sup>2</sup>event-of-teaching  
<sup>3</sup>event-of-hunting  
<sup>4</sup>trap  
<sup>5</sup>crime-taker  
<sup>6</sup>event-fearing  
<sup>1</sup>line-group  
<sup>2</sup>adjacent-group  
<sup>3</sup>complete-group  
<sup>4</sup>pull-machine

<i>junla dadysli</i> <sup>1</sup>	clock pendulum	Hun
<i>purdi vorme</i>	garden door	Qab
<i>purdi bitmu</i>	garden wall	Que
<i>moklu skapi</i>	mouth skin	Imb = lips
<i>nazbi kevna</i>	nose hole	Imb = nostril
<i>karce xislu</i>	automobile wheel	Chi
<i>jipci pimlu</i>	chicken feather	Chi
<i>vinji rebla</i>	airplane tail	Chi

Conversely: the seltau specifies a characteristic or important detail of the object described by the tertau; objects described by the tanru as a whole are differentiated from other similar objects by this detail.

**Definition 5.13**

<i>pixra cukta</i>	picture book	Eng
<i>kerfa silka</i>	hair silk	Kar = velvet
<i>plise tapla</i>	apple cake	Tur
<i>dadysli junla</i>	pendulum clock	Hun

The tertau specifies a general class of object (a genus), and the seltau specifies a sub-class of that class (a species):

**Definition 5.14**

<i>ckunu tricu</i>	pine tree	Hun, Tur, Hop
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The tertau specifies an object of possession, and the seltau may specify the possessor (the possession may be intrinsic or otherwise). In English, these compounds have an explicit possessive element in them: “lion’s mane”, “child’s foot”, “noble’s cow”.

**Definition 5.15**

<i>cinfo kerfa</i>	lion mane	Kor, Tur, Hun, Udm, Qab
<i>verba jamfu</i>	child foot	Swe
<i>nixli tuple</i>	girl leg	Swe
<i>cinfo jamfu</i>	lion foot	Que
<i>danlu skapi</i>	animal skin	Ewe
<i>ralju zdani</i>	chief house	Ewe
<i>jmive munje</i>	living world	Skt
<i>nobli bakni</i>	noble cow	Skt
<i>nolraitru</i> <sup>1</sup> <i>ralju</i>	king chief	Skt = emperor

The tertau specifies a habitat, and the seltau specifies the inhabitant:

**Definition 5.16**

<i>lanzu tumla</i>	family land	Eng
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<sup>1</sup>hang-oscillator

<sup>1</sup>nobly-superlative-ruler

The tertau specifies a causative agent, and the seltau specifies the effect of that cause:

Definition 5.17		
<i>kalselvi'i<sup>1</sup> gapci</i>	tear gas	Hun
<i>terbi'a<sup>2</sup> jurme</i>	disease germ	Tur
<i>fenki litki</i>	crazy liquid	Hop = whisky
<i>pinca litki</i>	urine liquid	Hop = beer
<i>kalselvi'i</i>		

Conversely: the tertau specifies an effect, and the seltau specifies its cause.

Definition 5.18		
<i>djacu barna</i>	water mark	Chi

The tertau specifies an instrument, and the seltau specifies the purpose of that instrument:

Definition 5.19		
<i>taxfu dadgreku<sup>1</sup></i>	garment rack	Chi
<i>tergu'i<sup>2</sup> ti'otci<sup>3</sup></i>	lamp shade	Chi
<i>xirma zdani</i>	horse house	Chi = stall
<i>nuzba tanbo</i>	news board	Chi = bulletin board

More vaguely: the tertau specifies an instrument, and the seltau specifies the object of the purpose for which that instrument is used:

Definition 5.20		
<i>cpina rokci</i>	pepper stone	Que = stone for grinding pepper
<i>jamfu djacu</i>	foot water	Skt = water for washing the feet
<i>grana mudri</i>	post wood	Skt = wood for making a post
<i>moklu djacu</i>	mouth water	Hun = water for washing the mouth
<i>lanme gerku</i>	sheep dog	Eng = dog for working sheep

The tertau specifies a product from some source, and the seltau specifies the source of the product:

Definition 5.21		
<i>moklu djacu</i>	mouth water	Aba, Qab = saliva
<i>ractu mapku</i>	rabbit hat	Rus
<i>jipci sovda</i>	chicken egg	Chi
<i>sikcurnu<sup>1</sup> silka</i>	silkworm silk	Chi
<i>mlatu kalci</i>	cat feces	Chi
<i>bifce lakse</i>	bee wax	Chi = beeswax
<i>cribe rectu</i>	bear meat	Tur, Kor, Hun, Udm, Aba
<i>solxrula<sup>2</sup> grasu</i>	sunflower oil	Tur, Kor, Hun, Udm, Aba
<i>bifce jisra</i>	bee juice	Hop = honey
<i>tatru litki</i>	breast liquid	Hop = milk

<sup>1</sup>eye-excreted-thing

<sup>2</sup>disease

<sup>1</sup>hang-frame

<sup>2</sup>source of illumination

<sup>3</sup>shadow-tool



<i>kanla djacu</i>	eye water	Kor = tear
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Conversely: the *tertau* specifies the source of a product, and the *seltau* specifies the product:

**Definition 5.22**

<i>silna jinto</i>	salt well	Chi
<i>kolme terkakpa</i> <sup>1</sup>	coal mine	Chi
<i>ctile jinto</i>	oil well	Chi

The *tertau* specifies an object, and the *seltau* specifies the material from which the object is made. This case is especially interesting, because the referent of the *tertau* may normally be made from just one kind of material, which is then overridden in the *tanru*.

**Definition 5.23**

<i>rokci cinfo</i>	stone lion	Eng
<i>snime nanmu</i>	snow man	Hun
<i>kliti cipni</i>	clay bird	Eng
<i>blaci kanla</i>	glass eye	Hun
<i>blaci kanla</i>	glass eye	Que = spectacles
<i>solji sicni</i>	gold coin	Tur
<i>solji junla</i>	gold watch	Tur, Kor, Hun
<i>solji djine</i>	gold ring	Udm, Aba, Que
<i>rokci zdani</i>	stone house	Imb
<i>mudri zdani</i>	wood house	Ewe = wooden house
<i>rokci bitmu</i>	stone wall	Ewe
<i>solji carce</i>	gold chariot	Skt
<i>mudri xarci</i>	wood weapon	Skt
<i>cmaro</i> <sup>1</sup> <i>dargu</i>	pebble road	Chi
<i>sudysrasu</i> <sup>2</sup> <i>cutci</i>	straw shoe	Chi

Note: the two senses of “*blaci kanla*” can be discriminated as:

**Example 5.14.1**

*blaci kanla bo tarmi*  
glass eye-shape  
glass eye

**Example 5.14.2**

*blaci kanla bo sidju*  
glass eye-helper  
spectacles

<sup>1</sup>silk-worm

<sup>2</sup>solar-flower

<sup>1</sup>source of digging

<sup>1</sup>small-rock

<sup>2</sup>dry-grass

The *tertau* specifies a typical object used to measure a quantity and the *seltau* specifies something measured. The *tanru* as a whole refers to a given quantity of the thing being measured. English does not have compounds of this form, as a rule.

**Definition 5.24**

<i>tumla spisa</i>	land piece	Tur = piece of land
<i>tcati kabri</i>	tea cup	Kor, Aba = cup of tea
<i>nanba spisa</i>	bread piece	Kor = piece of bread
<i>bukpu spisa</i>	cloth piece	Udm, Aba = piece of cloth
<i>djacu calkyguzme</i> <sup>1</sup>	water calabash	Ewe = calabash of water

The *tertau* specifies an object with certain implicit properties, and the *seltau* overrides one of those implicit properties:

**Definition 5.25**

<i>kensa bloti</i>	spaceship	Eng
<i>bakni verba</i>	cattle child	Ewe = calf

The *seltau* specifies a whole, and the *tertau* specifies a part which normally is associated with a different whole. The *tanru* then refers to a part of the *seltau* which stands in the same relationship to the whole *seltau* as the *tertau* stands to its typical whole.

**Definition 5.26**

<i>kosta degji</i>	coat finger	Hun = coat sleeve
<i>denci genja</i>	tooth root	Imb
<i>tricu stedu</i>	tree head	Imb

The *tertau* specifies the producer of a certain product, and the *seltau* specifies the product. In this way, the *tanru* as a whole distinguishes its referents from other referents of the *tertau* which do not produce the product.

**Definition 5.27**

<i>silka curnu</i>	silkworm	Tur, Hun, Aba
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The *tertau* specifies an object, and the *seltau* specifies another object which has a characteristic property. The *tanru* as a whole refers to those referents of the *tertau* which possess the property.

**Definition 5.28**

<i>sonci manti</i>	soldier ant	Eng
<i>ninmu bakni</i>	woman cattle	Imb = cow
<i>mamta degji</i>	mother finger	Imb = thumb
<i>cifnu degji</i>	baby finger	Imb = pinky
<i>pacraistu</i> <sup>1</sup> <i>zdani</i>	hell house	Skt
<i>fagri dapma</i>	fire curse	Skt = curse destructive as fire

<sup>1</sup>shell-fruit, calabash

As a particular case (when the property is that of resemblance): the *seltau* specifies an object which the referent of the *tanru* resembles.

**Definition 5.29**

<i>grutrceraso</i> <sup>1</sup>	cherry bomb	Eng
<i>jbama</i>		
<i>solji kerfa</i>	gold hair	Hun = golden hair
<i>kanla djacu</i>	eye water	Kar = spring
<i>bakni rokci</i>	bull stone	Mon = boulder

The *seltau* specifies a place, and the *tertau* an object characteristically located in or at that place.

**Definition 5.30**

<i>ckana boxfo</i>	bed sheet	Chi
<i>mrostu</i> <sup>1</sup> <i>mojysu'a</i> <sup>2</sup>	tomb monument	Chi = tombstone
<i>jubme terigusni</i>	table lamp	Chi
<i>foldi smacu</i>	field mouse	Chi
<i>briju ci'ajbu</i> <sup>3</sup>	office desk	Chi
<i>rirxe xirma</i>	river horse	Chi = hippopotamus
<i>xamsi gerku</i>	sea dog	Chi = seal
<i>cagyce'u</i> <sup>4</sup> <i>zdani</i>	village house	Skt

Specifically: the *tertau* is a place where the *seltau* is sold or made available to the public.

**Definition 5.31**

<i>cidja barja</i>	food bar	Chi = restaurant
<i>cukta barja</i>	book bar	Chi = library

The *seltau* specifies the locus of application of the *tertau*.

**Definition 5.32**

<i>kanla velmikce</i> <sup>1</sup>	eye medicine	Chi
<i>jgalu grasu</i>	nail oil	Chi = nail polish
<i>denci pesxu</i>	tooth paste	Chi

The *tertau* specifies an implement used in the activity denoted by the *seltau*.

**Definition 5.33**

<i>me la pinpan.</i>	Ping-Pong ball	Chi
<i>bolci</i>		

<sup>1</sup>evil-superlative-site

<sup>1</sup>fu'ivla for "cherry" based on Linnean name

<sup>1</sup>dead-site

<sup>2</sup>remember-structure

<sup>3</sup>write-table

<sup>4</sup>farm-community

<sup>1</sup>treatment used by doctor

The tertau specifies a protective device against the undesirable features of the referent of the seltau.

**Definition 5.34**

<i>carvi mapku</i>	rain cap	Chi
<i>carvi taxfu</i>	rain garment	Chi = raincoat
<i>vindu firgai</i> <sup>1</sup>	poison mask	Chi = gas mask

The tertau specifies a container characteristically used to hold the referent of the seltau.

**Definition 5.35**

<i>cukta vasru</i>	book vessel	Chi = satchel
<i>vanju kabri</i>	wine cup	Chi
<i>spatrkokka</i> <sup>1</sup> <i>lanka</i>	coca basket	Que
<i>djacu calkyzme</i>	water calabash	Ewe
<i>rismi dakli</i>	rice bag	Ewe, Chi
<i>tcati kabri</i>	tea cup	Chi
<i>ladru botpi</i>	milk bottle	Chi
<i>rismi patxu</i>	rice pot	Chi
<i>festi lante</i>	trash can	Chi
<i>bifce zdani</i>	bee house	Kor = beehive
<i>cladakysa</i> ' <sup>2</sup> <i>zdani</i>	sword house	Kor = sheath
<i>manti zdani</i>	ant nest	Gua = anthill

The seltau specifies the characteristic time of the event specified by the tertau.

**Definition 5.36**

<i>vensa djedi</i>	spring day	Chi
<i>crisa citsi</i>	summer season	Chi
<i>cerni bumru</i>	morning fog	Chi
<i>critu lunra</i>	autumn moon	Chi
<i>dunra nictē</i>	winter night	Chi
<i>nictē ckule</i>	night school	Chi

The seltau specifies a source of energy for the referent of the tertau.

**Definition 5.37**

<i>dikca tergusni</i> <sup>1</sup>	electric lamp	Chi
<i>ratni nejni</i>	atom energy	Chi
<i>brife</i>	molki windmill	Tur, Kor, Hun, Udm, Aba

Finally, some tanru which don't fall into any of the above categories.

<sup>1</sup>face-cover

<sup>1</sup>fu'ivla for "coca"

<sup>2</sup>long-knife-weapon

<sup>1</sup>illumination-source

**Definition 5.38**

<i>ladru denci</i>	milk tooth	Tur, Hun, Udm, Qab
<i>kanla denci</i>	eye tooth	

It is clear that “tooth” is being specified, and that “milk” and “eye” act as modifiers. However, the relationship between “ladru” and “denci” is something like “tooth which one has when one is drinking milk from one’s mother”, a relationship certainly present nowhere except in this particular concept. As for “kanla denci”, the relationship is not only not present on the surface, it is hardly possible to formulate it at all.

## 5.15 Some types of symmetrical tanru

This section deals with symmetrical tanru, where order is not important. Many of these tanru can be expressed with a logical or non-logical connective between the components.

The tanru may refer to things which are correctly specified by both tanru components. Some of these instances may also be seen as asymmetrical tanru where the seltau specifies a material. The connective “je” is appropriate:

**Definition 5.39**

<i>cipnrstrigi</i> <sup>1</sup>	owl demon	Skt
<i>pacru'</i> <sup>2</sup>		
<i>nolraitru prijē</i>	royal sage	Skt
<i>remna nakni</i>	human-being male	Qab = man
<i>remna fetsi</i>	human-being female	Qab = woman
<i>sonci tolvri</i> <sup>3</sup>	soldier coward	Que
<i>panzi nanmu</i>	offspring man	Ewe = son
<i>panzi ninmu</i>	offspring woman	Ewe = daughter
<i>solji sicni</i>	gold coin	Tur
<i>solji junla</i>	gold watch	Tur, Kor, Hun
<i>solji djine</i>	gold ring	Udm, Aba, Que
<i>rokci zdani</i>	stone house	Imb
<i>mudri zdani</i>	wooden house	Ewe
<i>rokci bitmu</i>	stone wall	Ewe
<i>solji carce</i>	gold chariot	Skt
<i>mudri xarci</i>	wooden weapon	Skt
<i>zdani tcadu</i>	home town	Chi

The tanru may refer to all things which are specified by either of the tanru components. The connective “ja” is appropriate:

**Definition 5.40**

<i>nunji'a</i> <sup>1</sup>	<i>nun-</i>	victory	
<i>terji'a</i> <sup>2</sup>		defeat	Skt = victory or defeat

<i>donri nictē</i>	day night	Skt = day and night
<i>lunra tarci</i>	moon stars	Skt = moon and stars
<i>patfu mamta</i>	father mother	Imb, Kaz, Chi = parents
<i>tuple birka</i>	leg arm	Kaz = extremity
<i>nuncti<sup>3</sup> nunpinxe<sup>4</sup></i>	eating drinking	Udm = cuisine
<i>bersa tixnu</i>	son daughter	Chi = children

Alternatively, the tanru may refer to things which are specified by either of the tanru components or by some more inclusive class of things which the components typify:

**Definition 5.41**

<i>curnu jalra</i>	worm beetle	Mon = insect
<i>jalra curnu</i>	beetle worm	Mon = insect
<i>kabri palta</i>	cup plate	Kaz = crockery
<i>jipci gunse</i>	hen goose	Qab = housefowl
<i>xrula tricū</i>	flower tree	Chi = vegetation

The tanru components specify crucial or typical parts of the referent of the tanru as a whole:

**Definition 5.42**

<i>tumla vacri</i>	land air	Fin = world
<i>moklu stedū</i>	mouth head	Aba = face
<i>sudysrasu cunmi</i>	hay millet	Qab = agriculture
<i>gugde ciste</i>	state system	Mon = politics
<i>prenu so'ime<sup>1</sup></i>	people multitude	Mon = masses
<i>djacu dertu</i>	water earth	Chi = climate

## 5.16 *Pretty little girls' school: forty ways to say it*

The following examples show every possible grouping arrangement of “melbi cmalu nixli ckule” using “bo” or “ke ... ke'e” for grouping and “je” or “jebo” for logical connection. Most of these are definitely not plausible interpretations of the English phrase “pretty little girls' school”, especially those which describe something which is both a girl and a school.

Example 5.4.2, Example 5.4.3, Example 5.4.4, Example 5.4.5, and Example 5.5.6 are repeated here as Example 5.16.1, Example 5.16.9, Example 5.16.17, Example 5.16.25, and Example 5.16.33 respectively. The seven examples following each of these share the same grouping pattern, but differ in the presence or absence of “je” at each possible site. Some of the examples have more than one Lojban version. In that case, they differ only in grouping mechanism, and are always equivalent in meaning.

The logical connective “je” is associative: that is, “A and (B and C)” is the same as “(A and B) and C”. Therefore, some of the examples have the same meaning as others. In particular,

<sup>1</sup>event-of-winning

<sup>2</sup>event-of-losing

<sup>3</sup>event-of-eating

<sup>4</sup>event-of-drinking

<sup>1</sup>manysome

Example 5.16.8, Example 5.16.16, Example 5.16.24, Example 5.16.32, and Example 5.16.40 all have the same meaning because all four brivla are logically connected and the grouping is simply irrelevant. Other equivalent forms are noted in the examples themselves. However, if “je” were replaced by “naja” or “jo” or most of the other logical connectives, the meanings would become distinct.

It must be emphasized that, because of the ambiguity of all tanru, the English translations are by no means definitive — they represent only one possible interpretation of the corresponding Lojban sentence.

**Example 5.16.1**

melbi cmalu nixli ckule  
 ((pretty type-of little) type-of girl) type-of school  
 school for girls who are beautifully small

**Example 5.16.2**

melbi je cmalu nixli ckule  
 ((pretty and little) type-of girl) type-of school  
 school for girls who are beautiful and small

**Example 5.16.3**

melbi bo cmalu je nixli ckule  
 ((pretty type-of little) and girl) type-of school  
 school for girls and for beautifully small things

**Example 5.16.4**

ke melbi cmalu nixli ke'e je ckule  
 ((pretty type-of little) type-of girl) and school  
 thing which is a school and a beautifully small girl

**Example 5.16.5**

melbi je cmalu je nixli ckule  
 ((pretty and little) and girl) type-of school  
 school for things which are beautiful, small, and girls  
 Note: same as Example 5.16.21

**Example 5.16.6**

melbi bo cmalu je nixli je ckule  
 ((pretty type-of little) and girl) and school  
 thing which is beautifully small, a school, and a girl  
 Note: same as Example 5.16.14

**Example 5.16.7**

ke melbi je cmalu nixli ke'e je ckule  
 ((pretty and little) type-of girl) and school  
 thing which is a school and a girl who is both beautiful and small

**Example 5.16.8**

melbi je cmalu je nixli je ckule  
 ((pretty and little) and girl) and school  
 thing which is beautiful, small, a girl, and a school

**Example 5.16.9**

melbi cmalu nixli bo ckule  
 (pretty type-of little) type-of (girl type-of school)  
 girls' school which is beautifully small

**Example 5.16.10**

melbi je cmalu nixli bo ckule  
 (pretty and little) type-of (girl type-of school)  
 girls' school which is beautiful and small

**Example 5.16.11**

melbi cmalu nixli je ckule  
 (pretty type-of little) type-of (girl and school)  
 something which is a girl and a school which is beautifully small

**Example 5.16.12**

melbi bo cmalu je nixli bo ckule  
 (pretty type-of little) and (girl type-of school)  
 something which is beautifully small and a girls' school

**Example 5.16.13**

melbi je cmalu nixli je ckule  
 (pretty and little) type-of (girl and school)  
 a pretty and little type of thing which is both a girl and a school

**Example 5.16.14**

melbi bo cmalu je nixli jebo ckule  
 (pretty type-of little) and (girl and school)  
 thing which is beautifully small, a school, and a girl  
 Note: same as Example 5.16.6

**Example 5.16.15**

melbi jebo cmalu je nixli bo ckule  
 (pretty and little) and (girl type-of school)  
 thing which is beautiful and small and a girl's school  
 Note: same as Example 5.16.30

**Example 5.16.16**

melbi jebo cmalu je nixli jebo ckule  
 (pretty and little) and (girl and school)  
 thing which is beautiful, small, a girl, and a school  
 Note: same as Example 5.16.14



**Example 5.16.17**

melbi cmalu bo nixli ckule  
 (pretty type-of (little type-of girl)) type-of school  
 school for beautiful girls who are small

**Example 5.16.18**

melbi cmalu je nixli ckule  
 (pretty type-of (little and girl)) type-of school  
 school for beautiful things which are small and are girls

**Example 5.16.19**

melbi je cmalu bo nixli ckule  
 (pretty and (little type-of girl)) type-of school  
 school for things which are beautiful and are small girls

**Example 5.16.20**

ke melbi cmalu bo nixli ke'e je ckule  
 melbi bo cmalu bo nixli je ckule  
 (pretty type-of (little type-of girl)) and school  
 thing which is a school and a small girl who is beautiful

**Example 5.16.21**

melbi je cmalu jebo nixli ckule  
 (pretty and (little and girl)) type-of school  
 school for things which are beautiful, small, and girls  
 Note: same as Example 5.16.5

**Example 5.16.22**

melbi je cmalu bo nixli je ckule  
 (pretty and (little type-of girl)) and school  
 thing which is beautiful, a small girl, and a school  
 Note: same as Example 5.16.38

**Example 5.16.23**

ke melbi cmalu je nixli ke'e je ckule  
 (pretty type-of (little and girl)) and school  
 thing which is beautifully small, a beautiful girl, and a school

**Example 5.16.24**

melbi je cmalu jebo nixli je ckule  
 (pretty and (little and girl)) and school  
 thing which is beautiful, small, a girl, and a school

**Example 5.16.25**

melbi cmalu bo nixli bo ckule  
 melbi ke cmalu ke nixli ckule *<ke'e>* *<ke'e>*

pretty type-of (little type-of (girl type-of school))  
small school for girls which is beautiful

**Example 5.16.26**

melbi ke cmalu nixli je ckule ⟨*ke'e*⟩  
pretty type-of (little type-of (girl and school))  
small thing, both a girl and a school, which is beautiful

**Example 5.16.27**

melbi cmalu je nixli bo ckule  
pretty type-of (little and (girl type-of school))  
thing which is beautifully small and a girls' school that is beautiful

**Example 5.16.28**

melbi je cmalu bo nixli bo ckule  
melbi je ke cmalu nixli bo ckule ⟨*ke'e*⟩  
melbi je ke cmalu ke nixli ckule ⟨*ke'e*⟩ ⟨*ke'e*⟩  
pretty and (little type-of (girl type-of school))  
thing which is beautiful and a small type of girls' school

**Example 5.16.29**

melbi cmalu je nixli jebo ckule  
melbi cmalu je ke nixli je ckule ⟨*ke'e*⟩  
pretty type-of (little and (girl and school))  
thing which is beautifully small, a beautiful girl, and a beautiful school  
Note: same as Example 5.16.37

**Example 5.16.30**

melbi je cmalu jebo nixli bo ckule  
melbi je ke cmalu je nixli bo ckule ⟨*ke'e*⟩  
pretty and (little and (girl type-of school))  
thing which is beautiful, small and a girls' school  
Note: same as Example 5.16.15

**Example 5.16.31**

melbi je ke cmalu nixli je ckule ⟨*ke'e*⟩  
pretty and (little type-of (girl and school))  
beautiful thing which is a small girl and a small school

**Example 5.16.32**

melbi jebo cmalu jebo nixli jebo ckule  
pretty and (little and (girl and school))  
thing which is beautiful, small, a girl, and a school

**Example 5.16.33**

melbi ke cmalu nixli ckule ⟨*ke'e*⟩  
 pretty type-of ((little type-of girl) type-of school)  
 beautiful school for small girls

**Example 5.16.34**

melbi ke cmalu je nixli ckule ⟨*ke'e*⟩  
 pretty type-of ((little and girl) type-of school)  
 beautiful school for things which are small and are girls

**Example 5.16.35**

melbi ke cmalu bo nixli je ckule ⟨*ke'e*⟩  
 pretty type-of ((little type-of girl) and school)  
 beautiful thing which is a small girl and a school

**Example 5.16.36**

melbi je ke cmalu nixli ckule ⟨*ke'e*⟩  
 pretty and ((little type-of girl) type-of school)  
 thing which is beautiful and a school for small girls

**Example 5.16.37**

melbi cmalu je nixli je ckule  
 pretty type-of ((little and girl) and school)  
 thing which is beautifully small, a beautiful girl, and a beautiful school  
 Note: same as Example 5.16.29

**Example 5.16.38**

melbi je ke cmalu bo nixli je ckule ⟨*ke'e*⟩  
 pretty and ((little type-of girl) and school)  
 thing which is beautiful, a small girl and a school  
 Note: same as Example 5.16.22

**Example 5.16.39**

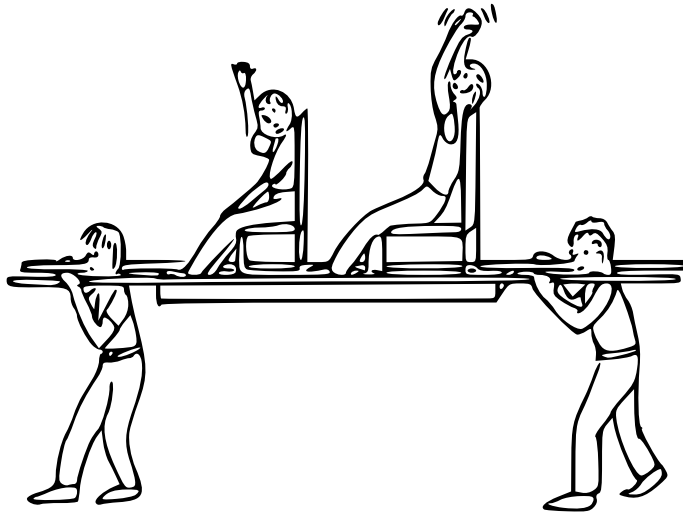
melbi je ke cmalu je nixli ckule ⟨*ke'e*⟩  
 pretty and ((little and girl) type-of school)  
 thing which is beautiful and is a small school and a girls' school

**Example 5.16.40**

melbi je ke cmalu je nixli je ckule ⟨*ke'e*⟩  
 pretty and ((little and girl) and school)  
 thing which is beautiful, small, a girl, and a school



# To Speak of Many Things: The Lojban sumti



*lei re nanmu cu bevri le re nanmu*

## 6.1 The five kinds of simple sumti

If you understand anything about Lojban, you know what a sumti is by now, right? An argument, one of those things that fills the places of simple Lojban sentences like:

**Example 6.1.1**  
mi klama le zarci  
I go-to the market

In Example 6.1.1, “mi” and “le zarci” are the sumti. It is easy to see that these two sumti are not of the same kind: “mi” is a pro-sumti (the Lojban analogue of a pronoun) referring to

the speaker, whereas “le zarci” is a description which refers to something described as being a market.

There are five kinds of simple sumti provided by Lojban:

1. descriptions like “le zarci”, which usually begin with a descriptor (called a *gadri* in Lojban) such as “le”;
2. pro-sumti, such as “mi”;
3. names, such as “la lojban.”, which usually begin with “la”;
4. quotations, which begin with “lu”, “le’u”, “zo”, or “zoi”;
5. pure numbers, which usually begin with “li”.

Here are a few examples of each kind of sumti:

**Example 6.1.2**

e’osai ko sarji la lojban.  
Please support Lojban!

Example 6.1.2 exhibits “ko”, a pro-sumti; and “la lojban.”, a name.

**Example 6.1.3**

mi cusku lu e’osai li’u le tcidu  
I express “Please!” to-the reader.

Example 6.1.3 exhibits “mi”, a pro-sumti; “lu e’osai li’u”, a quotation; and “le tcidu”, a description.

**Example 6.1.4**

ti mitre li ci  
This measures-in-meters the-number three.  
This is three meters long.

Example 6.1.4 exhibits “ti”, a pro-sumti; and “li ci”, a number.

Most of this chapter is about descriptions, as they have the most complicated syntax and usage. Some attention is also given to names, which are closely interwoven with descriptions. Pro-sumti, numbers, and quotations are described in more detail in Chapter 7, Chapter 18, and Chapter 19 respectively, so this chapter only gives summaries of their forms and uses. See Section 6.13 through Section 6.15 for these summaries.

## 6.2 The three basic description types

The following cmavo are discussed in this section:

**Definition 6.1**

<i>le</i>	the, the one(s) described as	<i>LE</i>
<i>lo</i>	some, some of those which really are	<i>LE</i>
<i>la</i>	the one(s) named	<i>LA</i>
<i>ku</i>	elidable terminator for LE, LA	<i>KU</i>

The syntax of descriptions is fairly complex, and not all of it can be explained within the confines of this chapter: relative clauses, in particular, are discussed in Chapter 8. However, most descriptions have just two components: a descriptor belonging to selma'o LE or LA, and a selbri. (The difference between selma'o LE and selma'o LA is not important until Section 6.12.) Furthermore, the selbri is often just a single brivla. Here is an elementary example:

**Example 6.2.1**

le zarci  
 one-or-more-specific-things-each-of-which-I-describe-as being-a-market  
 the market

The long gloss for “le” is of course far too long to use most of the time, and in fact “le” is quite close in meaning to English “the”. It has particular implications, however, which “the” does not have.

The general purpose of all descriptors is to create a sumti which might occur in the  $x_1$  place of the selbri belonging to the description. Thus “le zarci” conveys something which might be found in the  $x_1$  place of “zarci”, namely a market.

The specific purpose of “le” is twofold. First, it indicates that the speaker has one or more specific markets in mind (whether or not the listener knows which ones they are). Second, it also indicates that the speaker is merely describing the things he or she has in mind as markets, without being committed to the truth of that description.

**Example 6.2.2**

le zarci cu barda  
 one-or-more-specific-things-which-I-describe as “markets” is/are-big.  
 The market is big.  
 The markets are big.

Note that English-speakers must state whether a reference to markets is to just one (“the market”) or to more than one (“the markets”). Lojban requires no such forced choice, so both colloquial translations of Example 6.2.2 are valid. Only the context can specify which is meant. (This rule does not mean that Lojban has no way of specifying the number of markets in such a case: that mechanism is explained in Section 6.7.)

Now consider the following strange-looking example:

**Example 6.2.3**

le nanmu cu ninmu  
 one-or-more-specific-things-which-I-describe as “men” are women  
 The man is a woman.  
 The men are women.

Example 6.2.3 is not self-contradictory in Lojban, because “le nanmu” merely means something or other which, for my present purposes, I choose to describe as a man, whether or not it really is a man. A plausible instance would be: someone we had assumed to be a man at a distance turned out to be actually a woman on closer observation. Example 6.2.3 is what I would say to point out my observation to you.

In all descriptions with “le”, the listener is presumed to either know what I have in mind or else not to be concerned at present (perhaps I will give more identifying details later). In particular, I might be pointing at the supposed man or men: Example 6.2.3 would then be

perfectly intelligible, since “le nanmu” merely clarifies that I am pointing at the supposed man, not at a landscape, or a nose, which happens to lie in the same direction.

The second descriptor dealt with in this section is “lo”. Unlike “le”, “lo” is nonspecific:

**Example 6.2.4**

lo zarci  
 one-or-more-of-all-the-things-which-really are-markets  
 a market  
 some markets

Again, there are two colloquial English translations. The effect of using “lo” in Example 6.2.4 is to refer generally to one or more markets, without being specific about which. Unlike “le zarci”, “lo zarci” must refer to something which actually is a market (that is, which can appear in the  $x_1$  place of a truthful bridri whose selbri is “zarci”). Thus

**Example 6.2.5**

lo nanmu cu ninmu  
 Some man is a woman.  
 Some men are women.

must be false in Lojban, given that there are no objects in the real world which are both men and women. Pointing at some specific men or women would not make Example 6.2.5 true, because those specific individuals are no more both-men-and-women than any others. In general, “lo” refers to whatever individuals meet its description.

The last descriptor of this section is “la”, which indicates that the selbri which follows it has been dissociated from its normal meaning and is being used as a name. Like “le” descriptions, “la” descriptions are implicitly restricted to those I have in mind. (Do not confuse this use of “la” with its use before regular Lojbanized names, which is discussed in Section 6.12.) For example:

**Example 6.2.6**

la cribe pu finti le lisri  
 the-one-named “bear” *<past>* creates the story.  
 Bear wrote the story.

In Example 6.2.6, “la cribe” refers to someone whose naming predicate is “cribe”, i.e. “Bear”. In English, most names don’t mean anything, or at least not anything obvious. The name “Frank” coincides with the English word “frank”, meaning “honest”, and so one way of translating “Frank ate some cheese” into Lojban would be:

**Example 6.2.7**

la stace pu citka lo cirka  
 The-one-called “Honest/Frank” *<past>* eats some cheese.

English-speakers typically would not do this, as we tend to be more attached to the sound of our names than their meaning, even if the meaning (etymological or current) is known. Speakers of other languages may feel differently. (In point of fact, “Frank” originally meant “the free one” rather than “the honest one”.)

It is important to note the differences between Example 6.2.6 and the following:



**Example 6.2.8**

le cribe pu finti le lisri

One-or-more-specific-things-which-I-describe-as a-bear *<past>* creates the story.

The bear(s) wrote the story.

**Example 6.2.9**

lo cribe pu finti le lisri

One-or-more-of-the-things-which-really are-bears *<past>* creates the story.

A bear wrote the story.

Some bears wrote the story.

Example 6.2.8 is about a specific bear or bearlike thing(s), or thing(s) which the speaker (perhaps whimsically or metaphorically) describes as a bear (or more than one); Example 6.2.9 is about one or more of the really existing, objectively defined bears. In either case, though, each of them must have contributed to the writing of the story, if more than one bear (or “bear”) is meant.

(The notion of a “really existing, objectively defined bear” raises certain difficulties. Is a panda bear a “real bear”? How about a teddy bear? In general, the answer is “yes”. Lojban gismu are defined as broadly as possible, allowing *tanru* and *lujvo* to narrow down the definition. There probably are no necessary and sufficient conditions for defining what is and what is not a bear that can be pinned down with complete precision: the real world is fuzzy. In borderline cases, “le” may communicate better than “lo”.)

So while Example 6.2.6 could easily be true (there is a real writer named “Greg Bear”), and Example 6.2.8 could be true if the speaker is sufficiently peculiar in what he or she describes as a bear, Example 6.2.9 is certainly false.

Similarly, compare the following two examples, which are analogous to Example 6.2.8 and Example 6.2.9 respectively:

**Example 6.2.10**

le remna pu finti le lisri

The human being(s) wrote the story.

**Example 6.2.11**

lo remna pu finti le lisri

A human being wrote the story.

Some human beings wrote the story.

Example 6.2.10 says who the author of the story is: one or more particular human beings that the speaker has in mind. If the topic of conversation is the story, then Example 6.2.10 identifies the author as someone who can be pointed out or who has been previously mentioned; whereas if the topic is a person, then “le remna” is in effect a shorthand reference to that person. Example 6.2.11 merely says that the author is human.

The elidable terminator for all descriptions is “ku”. It can almost always be omitted with no danger of ambiguity. The main exceptions are in certain uses of relative clauses, which are discussed in Chapter 8, and in the case of a description immediately preceding the *selbri*. In this latter case, using an explicit “cu” before the *selbri* makes the “ku” unnecessary. There are also a few other uses of “ku”: in the compound negator “naku” (discussed in Chapter 15) and to terminate place-structure, tense, and modal tags that do not have associated *sumti* (discussed in Chapter 9 and Chapter 10).

## 6.3 Individuals and masses

The following cmavo are discussed in this section:

### Definition 6.2

<i>lei</i>	the mass I describe as	<i>LE</i>
<i>loi</i>	part of the mass of those which really are	<i>LE</i>
<i>lai</i>	the mass of those named	<i>LA</i>

All Lojban sumti are classified by whether they refer to one of three types of objects, known as *individuals*, *masses*, and *sets*. The term “individual” is misleading when used to refer to more than one object, but no less-confusing term has as yet been found. All the descriptions in Sections 1 and 2 refer to individuals, whether one or more than one. Consider the following example:

### Example 6.3.1

le prenu cu bevri le pipno  
 One-or-more-of-those-I-describe-as persons carry the piano.  
 The person(s) carry the piano.

(Of course the second “le” should really get the same translation as the first, but I am putting the focus of this discussion on the first “le”, the one preceding “prenu”. I will assume that there is only one piano under discussion.)

Suppose the context of Example 6.3.1 is such that you can determine that I am talking about three persons. What am I claiming? I am claiming that each of the three persons carried the piano. This claim can be true if the persons carried the piano one at a time, or in turns, or in a variety of other ways. But in order for Example 6.3.1 to be true, I must be willing to assert that person 1 carried the piano, and that person 2 carried the piano, and that person 3 carried the piano.

But suppose I am not willing to claim that. For in fact pianos are heavy, and very few persons can carry a piano all by themselves. The most likely factual situation is that person 1 carried one end of the piano, and person 2 the other end, while person 3 either held up the middle or else supervised the whole operation without actually lifting anything. The correct way of expressing such a situation in Lojban is:

### Example 6.3.2

lei prenu cu bevri le pipno  
 The-mass-of-one-or-more-of-those-I-describe-as persons carry the piano.

Here the same three persons are treated not as individuals, but as a so-called *mass entity*, or just *mass*. A mass has the properties of each individual which composes it, and may have other properties of its own as well. This can lead to apparent contradictions. Thus suppose in the piano-moving example above that person 1 has fair skin, whereas person 2 has dark skin. Then it is correct to say that the person-mass has both fair skin and dark skin. Using the mass descriptor “lei” signals that ordinary logical reasoning is not applicable: contradictions can be maintained, and all sorts of other peculiarities may exist. However, we can safely say that a mass inherits only the component properties that are relevant to it; it would be ludicrous to say that a mass of two persons is of molecular dimensions, simply because some of the parts (namely, the molecules) of the persons are that small.

The descriptors “loi” and “lai” are analogous to “lo” and “la” respectively, but refer to masses either by property (“loi”) or by name (“lai”). A classic example of “loi” use is:

**Example 6.3.3**

loi cinfo cu xabju le fi'ortu'a  
 part-of-the-mass-of-those-which-really are-lions dwell in-the African-land.  
 The lion dwells in Africa.  
 Lions dwell in Africa.

The difference between “lei” and “loi” is that “lei cinfo” refers to a mass of specific individuals which the speaker calls lions, whereas “loi cinfo” refers to some part of the mass of all those individuals which actually are lions. The restriction to “some part of the mass” allows statements like Example 6.3.3 to be true even though some lions do not dwell in Africa — they live in various zoos around the world. On the other hand, Example 6.3.3 doesn't actually say that most lions live in Africa: equally true is

**Example 6.3.4**

loi glinanmu cu xabju le fi'ortu'a  
 part-of-the-mass-of-those-which-really are-English-men dwell in-the African-land.  
 The Englishman dwells in Africa.

since there is at least one Englishman living there. Section 6.4 explains another method of saying what is usually meant by “The lion lives in Africa” which does imply that living in Africa is normal, not exceptional, for lions.

Note that the Lojban mass articles are sometimes translated by English plurals (the most usual case), sometimes by English singulars (when the singular is used to express typicalness or abstraction), and sometimes by singulars with no article:

**Example 6.3.5**

loi matne cu ranti  
 part-of-the-mass-of-that-which-really is-a-quantity-of-butter is-soft.  
 Butter is soft.

Of course, some butter is hard (for example, if it is frozen butter), so the “part-of” implication of “loi” becomes once again useful. The reason this mechanism works is that the English words like “butter”, which are seen as already describing masses, are translated in Lojban by non-mass forms. The place structure of “matne” is “ $x_1$  is a quantity of butter from source  $x_2$ ”, so the single English word “butter” is translated as something like “a part of the mass formed from all the quantities of butter that exist”. (Note that the operation of forming a mass entity does not imply, in Lojban, that the components of the mass are necessarily close to one another or even related in any way other than conceptually. Masses are formed by the speaker's intention to form a mass, and can in principle contain anything.)

The mass name descriptor “lai” is used in circumstances where we wish to talk about a mass of things identified by a name which is common to all of them. It is not used to identify a mass by a single name peculiar to it. Thus the mass version of Example 6.2.5,

**Example 6.3.6**

lai cribe pu finti le vi cukta  
 the-mass-of-those-named “bear” *<past>* creates the nearby book.  
 The Bears wrote this book.

in a context where “la cribe” would be understood as plural, would mean that either Tom Bear or Fred Bear (to make up some names) might have written the book, or that Tom and Fred might have written it as collaborators. Using “la” instead of “lai” in Example 6.3.6 would give the implication that each of Tom and Fred, considered individually, had written it.

## 6.4 Masses and sets

The following cmavo are discussed in this section:

### Definition 6.3

<i>le'i</i>	the set described as	<i>LE</i>
<i>lo'i</i>	the set of those which really are	<i>LE</i>
<i>la'i</i>	the set of those named	<i>LA</i>

Having said so much about masses, let us turn to sets. Sets are easier to understand than masses, but are more rarely used. Like a mass, a set is an abstract object formed from a number of individuals; however, the properties of a set are not derived from any of the properties of the individuals that compose it.

Sets have properties like cardinality (how many elements in the set), membership (the relationship between a set and its elements), and set inclusion (the relationship between two sets, one of which — the superset — contains all the elements of the other — the subset). The set descriptors “le'i”, “lo'i” and “la'i” correspond exactly to the mass descriptors “lei”, “loi”, and “lai” except that normally we talk of the whole of a set, not just part of it. Here are some examples contrasting “lo”, “loi”, and “lo'i”:

### Example 6.4.1

lo ratcu cu bunre  
 one-or-more-of-those-which-really-are rats are-brown.  
 Some rats are brown.

### Example 6.4.2

loi ratcu cu cmalu  
 part-of-the-mass-of-those-which-really-are rats are-small.  
 Rats are small.

### Example 6.4.3

lo'i ratcu cu barda  
 The-set-of rats is-large.  
 There are a lot of rats.

The mass of rats is small because at least one rat is small; the mass of rats is also large; the set of rats, though, is unquestionably large — it has billions of members. The mass of rats is also brown, since some of its components are; but it would be incorrect to call the set of rats brown — brown-ness is not the sort of property that sets possess.

Lojban speakers should generally think twice before employing the set descriptors. However, certain predicates have places that require set sumti to fill them. For example, the place structure of “fadni” is:  $x_1$  is ordinary/common/typical/usual in property  $x_2$  among the members of set  $x_3$ . Why is it necessary for the  $x_3$  place of “fadni” to be a set? Because it makes no

sense for an individual to be typical of another individual: an individual is typical of a group. In order to make sure that the bridi containing “fadni” is about an entire group, its  $x_3$  place must be filled with a set:

**Example 6.4.4**

mi fadni fi lo'i lobypli  
 I am-ordinary among the-set-of Lojban-users.  
 I am a typical Lojban user.

Note that the  $x_2$  place has been omitted; I am not specifying in exactly which way I am typical — whether in language knowledge, or age, or interests, or something else. If “lo'i” were changed to “lo” in Example 6.4.4, the meaning would be something like “I am typical of some Lojban user”, which is nonsense.

## 6.5 Descriptors for typical objects

The following cmavo are discussed in this section:

**Definition 6.4**

<i>lo'e</i>	the typical	<i>LEs</i>
<i>le'e</i>	the stereotypical	<i>LE</i>

As promised in Section 6.3, Lojban has a method for discriminating between “the lion” who lives in Africa and “the Englishman” who, generally speaking, doesn't live in Africa even though some Englishmen do. The descriptor “lo'e” means “the typical”, as in

**Example 6.5.1**

lo'e cinfo cu xabju le fi'ortu'a  
 The-typical lion dwells-in the African-land.  
 The lion dwells in Africa.

What is this “typical lion”? Surely it is not any particular lion, because no lion has all of the “typical” characteristics, and (worse yet) some characteristics that all real lions have can't be viewed as typical. For example, all real lions are either male or female, but it would be bizarre to suppose that the typical lion is either one. So the typical lion has no particular sex, but does have a color (golden brown), a residence (Africa), a diet (game), and so on. Likewise we can say that

**Example 6.5.2**

lo'e glinanmu cu xabju le fi'ortu'a na.e le gligugde  
 The-typical English-man dwells-in the African-land (Not!) and the English-country.  
 The typical Englishman dwells not in Africa but in England.

The relationship between “lo'e cinfo” and “lo'i cinfo” may be explained thus: the typical lion is an imaginary lion-abstraction which best exemplifies the set of lions. There is a similar relationship between “le'e” and “le'i”:

**Example 6.5.3**

le'e xelso merko cu gusta ponse  
 The-stereotypical Greek-type-of American is-a-restaurant-type-of owner.  
 Lots of Greek-Americans own restaurants.

Here we are concerned not with the actual set of Greek-Americans, but with the set of those the speaker has in mind, which is typified by one (real or imaginary) who owns a restaurant. The word “stereotypical” is often derogatory in English, but “le’e” need not be derogatory in Lojban: it simply suggests that the example is typical in the speaker’s imagination rather than in some objectively agreed-upon way. Of course, different speakers may disagree about what the features of “the typical lion” are (some would include having a short intestine, whereas others would know nothing of lions’ intestines), so the distinction between “lo’e cinfo” and “le’e cinfo” may be very fine.

Furthermore,

**Example 6.5.4**

le'e skina cu se finti ne'i la xali,uyd.  
 The-stereotypical movie is-invented in Hollywood.

is probably true to an American, but might be false (not the stereotype) to someone living in India or Russia.

Note that there is no naming equivalent of “lo’e” and “le’e”, because there is no need, as a rule, for a “typical George” or a “typical Smith”. People or things who share a common name do not, in general, have any other common attributes worth mentioning.

## 6.6 Quantified sumti

The following cmavo are discussed in this section:

**Definition 6.5**

<i>ro</i>	all of/each of	<i>PA</i>
<i>su'o</i>	at least (one of)	<i>PA</i>

Quantifiers tell us how many: in the case of quantifiers with sumti, how many things we are talking about. In Lojban, quantifiers are expressed by numbers and mathematical expressions: a large topic discussed in some detail in Chapter 18. For the purposes of this chapter, a simplified treatment will suffice. Our examples will employ either the simple Lojban numbers “pa”, “re”, “ci”, “vo”, and “mu”, meaning “one”, “two”, “three”, “four”, “five” respectively, or else one of four special quantifiers, two of which are discussed in this section and listed above. These four quantifiers are important because every Lojban sumti has either one or two of them implicitly present in it — which one or two depends on the particular kind of sumti. There is more explanation of implicit quantifiers later in this section. (The other two quantifiers, “piro” and “pisu'o”, are explained in Section 6.7.)

Every Lojban sumti may optionally be preceded by an explicit quantifier. The purpose of this quantifier is to specify how many of the things referred to by the sumti are being talked about. Here are some simple examples contrasting sumti with and without explicit quantifiers:

**Example 6.6.1**

do cadzu le bisli  
You walk-on the ice.

**Example 6.6.2**

re do cadzu le bisli  
Two-of you walk-on the ice.

The difference between Example 6.6.1 and Example 6.6.2 is the presence of the explicit quantifier “re” in the latter example. Although “re” by itself means “two”, when used as a quantifier it means “two-of”. Out of the group of listeners (the number of which isn’t stated), two (we are not told which ones) are asserted to be “walkers on the ice”. Implicitly, the others (if any) are not walkers on the ice. In Lojban, you cannot say “I own three shoes” if in fact you own four shoes. Numbers need never be specified, but if they are specified they must be correct.

(This rule does not mean that there is no way to specify a number which is vague. The sentence

**Example 6.6.3**

mi ponse su’o ci cutci  
I possess at-least three shoes.

is true if you own three shoes, or four, or indeed any larger number. More details on vague numbers appear in the discussion of mathematical expressions in Chapter 18.)

Now consider Example 6.6.1 again. How many of the listeners are claimed to walk on the ice? The answer turns out to be: all of them, however many that is. So Example 6.6.1 and Example 6.6.4:

**Example 6.6.4**

ro do cadzu le bisli  
All-of you walk-on the ice.

turn out to mean exactly the same thing. This is a safe strategy, because if one of my listeners doesn’t turn out to be walking on the ice, I can safely claim that I didn’t intend that person to be a listener! And in fact, all of the personal pro-sumti such as “mi” and “mi’o” and “ko” obey the same rule. We say that personal pro-sumti have a so-called *implicit quantifier* of “ro” (all). This just means that if no quantifier is given explicitly, the meaning is the same as if the implicit quantifier had been used.

Not all sumti have “ro” as the implicit quantifier, however. Consider the quotation in:

**Example 6.6.5**

mi cusku lu do cadzu le bisli li’u  
I express *<quote>* you walk-on the ice *<unquote>*.  
I say, “You walk on the ice.”

What is the implicit quantifier of the quotation “lu do cadzu le bisli li’u”? Surely not “ro”. If “ro” were supplied explicitly, thus:

**Example 6.6.6**

mi cusku ro lu do cadzu le bisli li'u  
 I express all-of *<quote>* you walk-on the ice *<unquote>*.

the meaning would be something like “I say every occurrence of the sentence ‘You walk on the ice’”. Of course I don’t say every occurrence of it, only some occurrences. One might suppose that Example 6.6.5 means that I express exactly one occurrence, but it is more Lojbanic to leave the number unspecified, as with other sumti. We can say definitely, however, that I say it at least once.

The Lojban cmavo meaning “at least” is “su’o”, and if no ordinary number follows, “su’o” means “at least once”. (See Example 6.6.3 for the use of “su’o” with an ordinary number). Therefore, the explicitly quantified version of Example 6.6.5 is

**Example 6.6.7**

mi cusku su'o lu do cadzu le bisli li'u  
 I express at-least-one-of *<quote>* you walk-on the ice *<unquote>*.  
 I say one or more instances of “You walk on the ice”.  
 I say “You walk on the ice”.

If an explicit ordinary number such as “re” were to appear, it would have to convey an exact expression, so

**Example 6.6.8**

mi cusku re lu do cadzu le bisli li'u  
 I express two-of *<quote>* you walk-on the ice *<unquote>*.

means that I say the sentence exactly twice, neither more nor less.

## 6.7 Quantified descriptions

The following cmavo are discussed in this section:

**Definition 6.6**

<i>piro</i>	the whole of	<i>PA</i>
<i>pisu'o</i>	a part of	<i>PA</i>

Like other sumti, descriptions can be quantified. When a quantifier appears before a description, it has the same meaning as one appearing before a non-description sumti: it specifies how many things, of all those referred to by the description, are being talked about in this particular bridi. Suppose that context tells us that “le gerku” refers to three dogs. Then we can say that exactly two of them are white as follows:

**Example 6.7.1**

re le gerku cu blabi  
 two-of the dogs are-white.  
 Two of the dogs are white.



When discussing descriptions, this ordinary quantifier is called an *outer quantifier*, since it appears outside the description. But there is another possible location for a quantifier: between the descriptor and the selbri. This quantifier is called an *inner quantifier*, and its meaning is quite different: it tells the listener how many objects the description selbri characterizes.

For example, the context of Example 6.7.1 supposedly told us that “le gerku” referred to some three specific dogs. This assumption can be made certain with the use of an explicit inner quantifier:

**Example 6.7.2**

re le ci gerku cu blabi  
two-of the three dogs are-white.  
Two of the three dogs are white.

(As explained in the discussion of Example 6.6.3, simple numbers like those in Example 6.7.2 must be exact: it therefore follows that the third dog cannot be white.)

You may also specify an explicit inner quantifier and leave the outer quantifier implicit:

**Example 6.7.3**

le ci gerku cu blabi  
the three dogs are-white.  
The three dogs are white.

There are rules for each of the 11 descriptors specifying what the implicit values for the inner and outer quantifiers are. They are meant to provide sensible default values when context is absent, not necessarily to prescribe hard and fast rules. The table below lists the implicit values.

Descriptor	Outer	Inner	Meaning
le	ro	su'o	all of the at-least-one described as
lo	su'o	ro	at least one of all of those which really are
la	ro	su'o	all of the at least one named
lei	pisu'o	su'o	some part of the mass of the at-least-one described as
loi	pisu'o	ro	some part of the mass of all those that really are
lai	pisu'o	su'o	some part of the mass of the at-least-one named
le'i	piro	su'o	the whole of the set of the at-least-one described as
lo'i	piro	ro	the whole of the set of all those that really are
la'i	piro	su'o	the whole of the set of the at-least-one named
le'e	ro	su'o	all the stereotypes of the at-least-one described as
lo'e	su'o	ro	at least one of the types of all those that really are

When examined for the first time, this table looks dreadfully arbitrary. In fact, there are quite a few regularities in it. First of all, the la-series (that is, the descriptors “la”, “lai”, and “la'i”) and the le-series (that is, the descriptors “le”, “lei”, “le'i”, and “le'e”) always have corresponding implicit quantifiers, so we may subsume the la-series under the le-series for the rest of this discussion: *le-series cmavo* will refer to both the le-series proper and to the la-series. The rule for the inner quantifier is very simple: the lo-series cmavo (namely, “lo”, “loi”, “lo'i”, and “lo'e”) all have an implicit inner quantifier of “ro”, whereas the le-series cmavo all have an implicit inner quantifier of “su'o”.

Why? Because lo-series descriptors always refer to all of the things which really fit into the  $x_1$  place of the selbri. They are not restricted by the speaker’s intention. Descriptors of the le-series, however, are so restricted, and therefore talk about some number, definite or indefinite, of objects the speaker has in mind — but never less than one.

Understanding the implicit outer quantifier requires rules of greater subtlety. In the case of mass and set descriptors, a single rule suffices for each: reference to a mass is implicitly a reference to some part of the mass; reference to a set is implicitly a reference to the whole set. Masses and sets are inherently singular objects: it makes no sense to talk about two distinct masses with the same components, or two distinct sets with the same members. Therefore, the largest possible outer quantifier for either a set description or a mass description is “piro”, the whole of it.

(Pedantically, it is possible that the mass of water molecules composing an ice cube might be thought of as different from the same mass of water molecules in liquid form, in which case we might talk about “re lei djacu”, two masses of the water-bits I have in mind.)

Why *pi*-? It is the Lojban cmavo for the decimal point. Just as “pimu” means “.5”, and when used as a quantifier specifies a portion consisting of five tenths of a thing, “piro” means a portion consisting of the all-ness — the entirety — of a thing. Similarly, “pisu’o” specifies a portion consisting of at least one part of a thing, i.e. some of it.

Smaller quantifiers are possible for sets, and refer to subsets. Thus “pimu le’i nanmu” is a subset of the set of men I have in mind; we don’t know precisely which elements make up this subset, but it must have half the size of the full set. This is the best way to say “half of the men”; saying “pimu le nanmu” would give us a half-portion of one of them instead! Of course, the result of “pimu le’i nanmu” is still a set; if you need to refer to the individuals of the subset, you must say so (see “lu’a” in Section 6.10).

The case of outer quantifiers for individual descriptors (including “le”, “lo”, “la”, and the typical descriptors “le’e” and “lo’e”) is special. When we refer to specific individuals with “le”, we mean to refer to all of those we have in mind, so “ro” is appropriate as the implicit quantifier, just as it is appropriate for “do”. Reference to non-specific individuals with “lo”, however, is typically to only some of the objects which can be correctly described, and so “su’o” is the appropriate implicit quantifier, just as for quotations.

From the English-speaking point of view, the difference in structure between the following example using “le”:

**Example 6.7.4**

⟨ro⟩ le ci gerku cu blabi  
 ⟨all-of⟩ those-described-as three dogs are-white.  
 The three dogs are white.

and the corresponding form with “lo”:

**Example 6.7.5**

ci lo ⟨ro⟩ gerku cu blabi  
 three-of those-which-are ⟨all⟩ dogs are-white  
 Three dogs are white.

looks very peculiar. Why is the number “ci” found as an inner quantifier in Example 6.7.4 and as an outer quantifier in Example 6.7.5? The number of dogs is the same in either case. The answer is that the “ci” in Example 6.7.4 is part of the specification: it tells us the actual number of dogs in the group that the speaker has in mind. In Example 6.7.5, however, the dogs referred

to by “... lo gerku” are all the dogs that exist: the outer quantifier then restricts the number to three; which three, we cannot tell. The implicit quantifiers are chosen to avoid claiming too much or too little: in the case of “le”, the implicit outer quantifier “ro” says that each of the dogs in the restricted group is white; in the case of “lo”, the implicit inner quantifier simply says that three dogs, chosen from the group of all the dogs there are, are white.

Using exact numbers as inner quantifiers in lo-series descriptions is dangerous, because you are stating that exactly that many things exist which really fit the description. So examples like

**Example 6.7.6**

⟨su'o⟩ lo ci gerku cu blabi  
 ⟨some-of⟩ those-which-really-are three dogs are-white

are semantically anomalous; Example 6.7.7 claims that some dog (or dogs) is white, but also that there are just three dogs in the universe!

Nevertheless, inner quantifiers are permitted on “lo” descriptors for consistency’s sake, and may occasionally be useful.

Note that the inner quantifier of “le”, even when exact, need not be truthful: “le ci nanmu” means “what I describe as three men”, not “three of what I describe as men”. This follows from the rule that what is described by a “le” description represents the speaker’s viewpoint rather than the objective way things are.

## 6.8 Indefinite descriptions

By a quirk of Lojban syntax, it is possible to omit the descriptor “lo”, but never any other descriptor, from a description like that of Example 6.7.5; namely, one which has an explicit outer quantifier but no explicit inner quantifier. The following example:

**Example 6.8.1**

ci gerku ⟨ku⟩ cu blabi  
 Three dogs are white.

is equivalent in meaning to Example 6.7.5. Even though the descriptor is not present, the elidable terminator “ku” may still be used. The name “indefinite description” for this syntactic form is historically based: of course, it is no more and no less indefinite than its counterpart with an explicit “lo”. Indefinite descriptions were introduced into the language in order to imitate the syntax of English and other natural languages.

Indefinite descriptions must fit this mold exactly: there is no way to make one which does not have an explicit outer quantifier (thus “\*gerku cu blabi” is ungrammatical), or which has an explicit inner quantifier (thus “\*reboi ci gerku cu blabi” is also ungrammatical — “re ci gerku cu blabi” is fine, but means “23 dogs are white”).

Note: Example 6.6.3 also contains an indefinite description, namely “su'o ci cutci”; another version of that example using an explicit “lo” would be:

**Example 6.8.2**

mi ponsu su'o ci lo cutci  
 I possess at-least three things-which-really-are shoes  
 I own three (or more) shoes.

## 6.9 sumti-based descriptions

As stated in Section 6.2, most descriptions consist of just a descriptor and a selbri. (In this chapter, the selbri have always been single gismu, but of course any selbri, however complex, can be employed in a description. The syntax and semantics of selbri are explained in Chapter 5.) In the intervening sections, inner and outer quantifiers have been added to the syntax. Now it is time to discuss a description of a radically different kind: the sumti-based description.

A sumti-based description has a sumti where the selbri would normally be, and the inner quantifier is required — it cannot be implicit. An outer quantifier is permitted but not required.

A full theory of sumti-based descriptions has yet to be worked out. One common case, however, is well understood. Compare the following:

### Example 6.9.1

re do cu nanmu  
Two-of you are-men.

### Example 6.9.2

le re do cu nanmu  
The two-of you are men.

Example 6.9.1 simply specifies that of the group of listeners, size unknown, two are men. Example 6.9.2, which has the sumti-based description “le re do”, says that of the two listeners, all (the implicit outer quantifier “ro”) are men. So in effect the inner quantifier “re” gives the number of individuals which the inner sumti “do” refers to. Here is another group of examples:

### Example 6.9.3

re le ci cribe cu bunre  
Two-of the three bears are-brown.

### Example 6.9.4

le re le ci cribe cu bunre  
The two-of the three bears are-brown.

### Example 6.9.5

pa le re le ci cribe cu bunre  
One-of the two-of the three bears are-brown.

In each case, “le ci cribe” restricts the bears (or alleged bears) being talked of to some group of three which the speaker has in mind. Example 6.9.3 says that two of them (which two is not stated) are brown. Example 6.9.4 says that a specific pair of them are brown. Example 6.9.5 says that of a specific pair chosen from the original three, one or the other of that pair is brown.

## 6.10 sumti qualifiers

The following cmavo are discussed in this section:

**Definition 6.7**

<i>la'e</i>	something referred to by	<i>LAhE</i>
<i>lu'e</i>	a reference to	<i>LAhE</i>
<i>tu'a</i>	an abstraction involving	<i>LAhE</i>
<i>lu'a</i>	an individual/member/component of	<i>LAhE</i>
<i>lu'i</i>	a set formed from	<i>LAhE</i>
<i>lu'o</i>	a mass formed from	<i>LAhE</i>
<i>vu'i</i>	a sequence formed from	<i>LAhE</i>
<i>na'ebo</i>	something other than	<i>NAhE+BO</i>
<i>to'ebo</i>	the opposite of	<i>NAhE+BO</i>
<i>no'ebo</i>	the neutral form of	<i>NAhE+BO</i>
<i>je'abo</i>	that which indeed is	<i>NAhE+BO</i>
<i>lu'u</i>	elidable terminator for LAhE and NAhE+BO	<i>LUhU</i>

Well, that's quite a list of cmavo. What are they all about?

The above cmavo and compound cmavo are called the *sumti qualifiers*. All of them are either single cmavo of selma'o LAhE, or else compound cmavo involving a scalar negation cmavo of selma'o NAhE immediately followed by "bo" of selma'o BO. Syntactically, you can prefix a sumti qualifier to any sumti and produce another simple sumti. (You may need to add the elidable terminator "lu'u" to show where the qualified sumti ends.)

Semantically, sumti qualifiers represent short forms of certain common special cases. Suppose you want to say "I see "The Red Pony"", where "The Red Pony" is the title of a book. How about:

**Example 6.10.1**

mi viska lu le xunre cmaxirma li'u  
I see *<quote>* the red small-horse *<unquote>*

But Example 6.10.1 doesn't work: it says that you see a piece of text "The Red Pony". That might be all right if you were looking at the cover of the book, where the words "The Red Pony" are presumably written. (More precisely, where the words "le xunre cmaxirma" are written — but we may suppose the book has been translated into Lojban.)

What you really want to say is:

**Example 6.10.2**

mi viska le selsinxax be lu le xunre cmaxirma li'u  
I see the thing-represented-by *<quote>* the red small-horse *<unquote>*

The  $x_2$  place of "selsinxax" (the  $x_1$  place of "sinxax") is a sign or symbol, and the  $x_1$  place of "selsinxax" (the  $x_2$  place of "sinxax") is the thing represented by the sign. Example 6.10.2 allows us to use a symbol (namely the title of a book) to represent the thing it is a symbol of (namely the book itself).

This operation turns out to be needed often enough that it's useful to be able to say:

**Example 6.10.3**

mi viska la'e lu le xunre cmaxirma li'u *<lu'u>*  
I see the-referent-of *<quote>* the red small-horse *<unquote>*.

So when “la’e” is prefixed to a sumti referring to a symbol, it produces a sumti referring to the referent of that symbol. (In computer jargon, “la’e” dereferences a pointer.)

By introducing a sumti qualifier, we correct a false sentence (Example 6.10.1), which too closely resembles its literal English equivalent, into a true sentence (Example 6.10.3), without having to change it overmuch; in particular, the structure remains the same. Most of the uses of sumti qualifiers are of this general kind.

The sumti qualifier “lu’e” provides the converse operation: it can be prefixed to a sumti referring to some thing to produce a sumti referring to a sign or symbol for the thing. For example,

**Example 6.10.4**

mi pu cusku lu’e le vi cukta  
 I ⟨*past*⟩ express a-symbol-for the nearby book.  
 I said the title of this book.

The equivalent form not using a sumti qualifier would be:

**Example 6.10.5**

mi pu cusku le sinxa be le vi cukta  
 I ⟨*past*⟩ express the symbol-for the nearby book.

which is equivalent to Example 6.10.4, but longer.

The other sumti qualifiers follow the same rules. The cmavo “tu’a” is used in forming abstractions, and is explained more fully in Chapter 11. The triplet “lu’a”, “lu’i”, and “lu’o” convert between individuals, masses, and sets; “vu’i” belongs to this group as well, but creates a sequence, which is similar to a set but has a definite order. (The set of John and Charles is the same as the set of Charles and John, but the sequences are different.) Here are some examples:

**Example 6.10.6**

mi troci tu’a le vorme  
 I try some-abstraction-about the door.  
 I try (to open) the door.

Example 6.10.6 might mean that I try to do something else involving the door; the form is deliberately vague. Most of the following examples make use of the cmavo “ri”, belonging to selma’o KOhA. This cmavo means “the thing last mentioned”; it is equivalent to repeating the immediately previous sumti (but in its original context). It is explained in more detail in Chapter 7.

**Example 6.10.7**

lo’i ratcu cu barda  
 .iku’i lu’a ri cmalu  
 the-set-of rats is-large.  
 But some-members-of it-last-mentioned is-small  
 The set of rats is large,  
 but some of its members are small.

**Example 6.10.8**

lo ratcu cu cmalu  
 .iku'i lu'i ri barda  
 some rats are-small.  
 But the-set-of them-last-mentioned is-large.  
 Some rats are small, but the set of rats is large.

**Example 6.10.9**

mi ce do girzu  
 .i lu'o ri gunma  
 .i vu'i ri porsu  
 I in-a-set-with you are-a-set.  
 The-mass-of it-last-mentioned is-a-mass.  
 The-sequence-of it-last-mentioned is-a-sequence  
 The set of you and me is a set.  
 The mass of you and me is a mass.  
 The sequence of you and me is a sequence.

(Yes, I know these examples are a bit silly. This set was introduced for completeness, and practical examples are as yet hard to come by.)

Finally, the four sumti qualifiers formed from a cmavo of NAhE and “bo” are all concerned with negation, which is discussed in detail in Chapter 15. Here are a few examples of negation sumti qualifiers:

**Example 6.10.10**

mi viska na'ebo le gerka  
 I see something-other-than the dog.

This compound, “na'ebo”, is the most common of the four negation sumti qualifiers. The others usually only make sense in the context of repeating, with modifications, something already referred to:

**Example 6.10.11**

mi nelci loi glare cidja  
 .ije do nelci  
 to'ebo ri  
 .ije la djein. nelci  
 no'ebo ra  
 I like part-of-the-mass-of hot-type-of food.  
 And you like  
 the-opposite-of the-last-mentioned.  
 And Jane likes  
 the-neutral-value-of something-mentioned.  
 I like hot food, and you like cold food,  
 and Jane likes lukewarm food.

(In Example 6.10.11, the sumti “ra” refers to some previously mentioned sumti other than that referred to by “ri”. We cannot use “ri” here, because it would signify “la djein.”, that being the most recent sumti available to “ri”. See more detailed explanations in Chapter 7.)

## 6.11 The syntax of vocative phrases

Vocative phrases are not sumti, but are explained in this chapter because their syntax is very similar to that of sumti. Grammatically, a vocative phrase is one of the so-called *free modifiers* of Lojban, along with subscripts, parentheses, and various other constructs explained in Chapter 19. They can be placed after many, but not all, constructions of the grammar: in general, after any elidable terminator (which, however, must not then be elided!), at the beginnings and ends of sentences, and in many other places.

The purpose of a vocative phrase is to indicate who the person being addressed is, or to indicate to that person that he or she ought to be listening. A vocative phrase begins with a cmavo of selma'o COI or DOI, all of which are explained in more detail in Chapter 13. Sometimes that is all there is to the phrase:

### Example 6.11.1

coi  
 ⟨greetings⟩  
 Hello.

### Example 6.11.2

je'e  
 ⟨acknowledgement⟩  
 Uh-huh.  
 Roger!

In these cases, the person being addressed is obvious from the context. However, a vocative word (more precisely, one or more cmavo of COI, possibly followed by “doi”, or else just “doi” by itself) can be followed by one of several kinds of phrases, all of which are intended to indicate the addressee. The most common case is a name:

### Example 6.11.3

coi. djan.  
 Hello, John.

A pause is required (for morphological reasons) between a member of COI and a name. You can use “doi” instead of a pause:

### Example 6.11.4

coi doi djan.  
 Hello, John.

means exactly the same thing and does not require a pause. Using “doi” by itself is like just saying someone’s name to attract his or her attention:

### Example 6.11.5

doi djan.  
 John!

In place of a name, a description may appear, lacking its descriptor, which is understood to be “le”:



**Example 6.11.6**

coi xunre pastu nixli  
 Hello, (red-type-of dress)-type-of girl.  
 Hello, girl with the red dress!

The listener need not really be a “xunre pastu nixli”, as long as she understands herself correctly from the description. (Actually, only a bare *selbri* can appear; explicit quantifiers are forbidden in this form of vocative, so the implicit quantifiers “su’o le ro” are in effect.)

Finally, a complete *sumti* may be used, the most general case.

**Example 6.11.7**

co’o la bab. .e la noras.  
 Goodbye, Bob and Nora.

Example 6.11.5 is thus the same as:

**Example 6.11.8**

coi le xunre pastu nixli  
 Hello, the-one-described-as red-dress girl!

and Example 6.11.4 is the same as:

**Example 6.11.9**

doi la djan.  
 The-one-named John!

Finally, the elidable terminator for vocative phrases is “do’u” (of *selma’o* DOhU), which is rarely needed except when a simple vocative word is being placed somewhere within a *bridi*. It may also be required when a vocative is placed between a *sumti* and its relative clause, or when there are a sequence of so-called *free modifiers* (vocatives, subscripts, utterance ordinals — see Chapter 18 — metalinguistic comments — see Chapter 19 — or reciprocals — see Chapter 19) which must be properly separated.

The meaning of a vocative phrase that is within a sentence is not affected by its position in the sentence: thus Example 6.11.9 and Example 6.11.10 mean the same thing:

**Example 6.11.10**

doi djan. ko klama mi  
 John, come to me!

**Example 6.11.11**

ko klama mi doi djan.  
 Come to me, John!

As usual for this chapter, the full syntax of vocative phrases has not been explained: relative clauses, discussed in Chapter 8, make for more possibilities.

## 6.12 Lojban names

Names have been used freely as *sumti* throughout this chapter without too much explanation. The time for the explanation has now come.

First of all, there are two different kinds of things usually called “names” when talking about Lojban. The naming predicates of Section 6.2 are just ordinary predicates which are being used in a special sense. In addition, though, there is a class of Lojban words which are used only to name things: these can be recognized by the fact that they end in a consonant followed by a pause. Some examples:

**Example 6.12.1**

djan. meris. djein. .alis.  
John. Mary. Jane. Alice.

(Note that “.alis.” begins as well as ends with a pause, because all Lojban words beginning with a vowel must be preceded by a pause. See Chapter 4 for more information.)

Names of this kind have two basic uses in Lojban: when used in a vocative phrase (see Section 6.11) they indicate who the listener is or should be. When used with a descriptor of selma'o LA, namely “la”, “lai”, or “la'i”, they form sumti which refer to the persons or things known by the name.

**Example 6.12.2**

la djonz. klama le zarci  
Jones goes to-the store.  
The Joneses go to-the store.

**Example 6.12.3**

lai djonz. klama le zarci  
The-mass-of Joneses go to-the store.  
The Joneses go to the store.

In Example 6.12.2, the significance is that all the persons (perhaps only one) I mean to refer to by the name “djonz.” are going to the store. In Example 6.12.3, the Joneses are massified, and only some part of them needs to be going. Of course, by “djonz.” I can mean whomever I want: that person need not use the name “djonz.” at all.

The sumti in Example 6.12.2 and Example 6.12.3 operate exactly like the similar uses of “la” and “lai” in Example 6.2.5 and Example 6.3.6 respectively. The only difference is that these descriptors are followed by Lojban name-words. And in fact, the only difference between descriptors of selma'o LA (these three) and of selma'o LE (all the other descriptors) is that the former can be followed by name-words, whereas the latter cannot.

There are certain limitations on the form of name-words in Lojban. In particular, they cannot contain the letter-sequences (or sound-sequences) *la*, *lai*, or *doi* unless a consonant immediately precedes within the name. Reciprocally, every name not preceded by “la”, “lai”, “la'i”, or “doi” must be preceded by a pause instead:

**Example 6.12.4**

coi .djan.  
Hello, John.

**Example 6.12.5**

zo .djan. cmene mi  
The-word “John” is-the-name-of me.  
My name is John.

In Example 6.12.4 and Example 6.12.5, “.djan.” appears with a pause before it as well as after it, because the preceding word is not one of the four special cases. These rules force names to always be separable from the general word-stream.

Unless some other rule prevents it (such as the rule that “zo” is always followed by a single word, which is quoted), multiple names may appear wherever one name is permitted, each with its terminating pause:

**Example 6.12.6**

doi djan. pol. djonz.  
 le bloti cu klama fi la niuport. niuz.  
 John Paul Jones,  
 the boat comes (to somewhere) from Newport News.

A name may not contain any consonant combination that is illegal in Lojban words generally: the “impermissible consonant clusters” of Lojban morphology (explained in Chapter 3). Thus “djeimz.” is not a valid version of “James” (because *mz* is invalid): “djeimyz” will suffice. Similarly, *la* may be replaced by *ly*, *lai* by *ly'i*, *doi* by *do'i* or *dai*. Here are a few examples:

English name	invalid	valid
Doyle	doi,l	do'il or dai,l
Lyra	lairas	ly'iras
Lottie (American pron.)	latis	LYtis. or lotis.

Names may be borrowed from other languages or created arbitrarily. Another common practice is to use one or more rafsi, arranged to end with a consonant, to form a name: thus the rafsi *loj-* for “logji” (logical) and *ban-* for “bangu” (language) unite to form the name of this language:

**Example 6.12.7**

lojban.  
 Lojban

When borrowing names from another language which end in a vowel, or when turning a Lojban brivla (all of which end in vowels) into a name, the vowel may be removed or an arbitrary consonant added. It is common (but not required) to use the consonants “s” or “n” when borrowing vowel-final names from English; speakers of other languages may wish to use other consonant endings. The implicit quantifier for name sumti of the form “la” followed by a name is “su'o”, just as for “la” followed by a selbri.

## 6.13 Pro-sumti summary

The Lojban pro-sumti are the cmavo of selma'o KOhA. They fall into several classes: personal, definable, quantificational, reflexive, back-counting, indefinite, demonstrative, metalinguistic, relative, question. More details are given in Chapter 7; this section mostly duplicates information found there, but adds material on the implicit quantifier of each pro-sumti.

The following examples illustrate each of the classes. Unless otherwise noted below, the implicit quantification for pro-sumti is “ro” (all). In the case of pro-sumti which refer to other

sumti, the “ro” signifies “all of those referred to by the other sumti”: thus it is possible to restrict, but not to extend, the quantification of the other sumti.

Personal pro-sumti (“mi”, “do”, “mi’o”, “mi’a”, “ma’a”, “do’o”, “ko”) refer to the speaker or the listener or both, with or without third parties:

**Example 6.13.1**

mi prami do  
I love you.

The personal pro-sumti may be interpreted in context as either representing individuals or masses, so the implicit quantifier may be “pisu’o” rather than “ro”: in particular, “mi’o”, “mi’a”, “ma’a”, and “do’o” specifically represent mass combinations of the individuals (you and I, I and others, you and I and others, you and others) that make them up.

Definable pro-sumti (“ko’a”, “ko’e”, “ko’i”, “ko’o”, “ko’u”, “fo’a”, “fo’e”, “fo’i”, “fo’o”, “fo’u”) refer to whatever the speaker has explicitly made them refer to. This reference is accomplished with “goi” (of selma’o GOI), which means “defined-as”.

**Example 6.13.2**

le cribe goi ko’a cu xekri  
.i ko’a citka le smacu  
The bear defined-as it-1 is-black.  
It-1 eats the mouse.

Quantificational pro-sumti (“da”, “de”, “di”) are used as variables in bridi involving predicate logic:

**Example 6.13.3**

ro da poi prenu  
cu prami pa de poi finpe  
All somethings-1 which-are persons  
love one something-2 which-is a-fish.  
All persons love a fish (each his/her own).

(This is not the same as “All persons love a certain fish”; the difference between the two is one of quantifier order.) The implicit quantification rules for quantificational pro-sumti are particular to them, and are discussed in detail in Chapter 16. Roughly speaking, the quantifier is “su’o” (at least one) when the pro-sumti is first used, and “ro” (all) thereafter.

Reflexive pro-sumti (“vo’a”, “vo’e”, “vo’i”, “vo’o”, “vo’u”) refer to the same referents as sumti filling other places in the same bridi, with the effect that the same thing is referred to twice:

**Example 6.13.4**

le cribe cu batci vo’a  
The bear bites what-is-in-the- $x_1$ -place.  
The bear bites itself.

Back-counting pro-sumti (“ri”, “ra”, “ru”) refer to the referents of previous sumti counted backwards from the pro-sumti:

**Example 6.13.5**

mi klama la frankfurt. ri  
 I go to-Frankfurt from-the-referent-of-the-last-sumti  
 I go from Frankfurt to Frankfurt (by some unstated route).

Indefinite pro-sumti (“zo’e”, “zu’i”, “zi’o”) refer to something which is unspecified:

**Example 6.13.6**

mi klama la frankfurt. zo’e zo’e zo’e  
 I go to-Frankfurt from-unspecified via-unspecified by-means-unspecified.

The implicit quantifier for indefinite pro-sumti is, well, indefinite. It might be “ro” (all) or “su’o” (at least one) or conceivably even “no” (none), though “no” would require a very odd context indeed.

Demonstrative pro-sumti (“ti”, “ta”, “tu”) refer to things pointed at by the speaker, or when pointing is not possible, to things near or far from the speaker:

**Example 6.13.7**

ko muvgau ti ta tu  
 you (*imperative*) move this-thing from-that-nearby-place to-that-further-away-place  
 Move this from there to over there!

Metalinguistic pro-sumti (“di’u”, “de’u”, “da’u”, “di’e”, “de’e”, “da’e”, “dei”, “do’i”) refer to spoken or written utterances, either preceding, following, or the same as the current utterance.

**Example 6.13.8**

li re su’i re du li vo  
 .i la’e di’u jetnu  
 The-number two plus two equals the-number four.  
 The-referent-of-the-previous-utterance is-true.

The implicit quantifier for metalinguistic pro-sumti is “su’o” (at least one), because they are considered analogous to “lo” descriptions: they refer to things which really are previous, current, or following utterances.

The relative pro-sumti (“ke’a”) is used within relative clauses (see Chapter 8 for a discussion of relative clauses) to refer to whatever sumti the relative clause is attached to.

**Example 6.13.9**

mi viska le mlatu ku  
 poi zo’e zbasu ke’a  
 loi slasi  
 I see the cat(s)  
 such-that something-unspecified makes it/them (the cats)  
 from-a-mass-of plastic.  
 I see the cat(s) made of plastic.

The question pro-sumti (“ma”) is used to ask questions which request the listener to supply a sumti which will make the question into a truth:

**Example 6.13.10**

do klama ma  
 You go to-what-sumti?  
 Where are you going?

The implicit quantifier for the question pro-sumti is “su’o” (at least one), because the listener is only being asked to supply a single answer, not all correct answers.

In addition, sequences of lerfu words (of selma’o BY and related selma’o) can also be used as definable pro-sumti.

## 6.14 Quotation summary

There are four kinds of quotation in Lojban: text quotation, words quotation, single-word quotation, non-Lojban quotation. More information is provided in Chapter 19.

Text quotations are preceded by “lu” and followed by “li’u”, and are an essential part of the surrounding text: they must be grammatical Lojban texts.

**Example 6.14.1**

mi cusku lu mi’e djan. li’u  
 I say the-text *<quote>* I-am John *<unquote>*.  
 I say “I’m John”.

Words quotations are quotations of one or more Lojban words. The words need not mean anything, but they must be morphologically valid so that the end of the quotation can be discerned.

**Example 6.14.2**

mi cusku lo’u li mi le’u  
 I say the-words *<quote>* “li mi” *<unquote>*.  
 I say “li mi”.

Note that the translation of Example 6.14.2 does not translate the Lojban words, because they are not presumed to have any meaning (in fact, they are ungrammatical).

Single-word quotation quotes a single Lojban word. Compound cmavo are not allowed.

**Example 6.14.3**

mi cusku zo .ai  
 I say the-word “.ai”.

Non-Lojban quotation can quote anything, Lojban or not, even non-speech such as drum talk, whistle words, music, or belching. A Lojban word which does not appear within the quotation is used before and after it to set it off from the surrounding Lojban text.

**Example 6.14.4**

mi cusku zoi kuot. I’m John .kuot  
 I say “I’m John”.

The implicit quantifier for all types of quotation is “su’o” (at least one), because quotations are analogous to “lo” descriptions: they refer to things which actually are words or sequences of words.

## 6.15 Number summary

The sumti which refer to numbers consist of the cmavo “li” (of selma’o LI) followed by an arbitrary Lojban mekso, or mathematical expression. This can be anything from a simple number up to the most complicated combination of numbers, variables, operators, and so on. Much more information on numbers is given in Chapter 18. Here are a few examples of increasing complexity:

### Example 6.15.1

li vo  
the-number four  
4

### Example 6.15.2

li re su’i re  
the-number two plus two  
 $2 + 2$

### Example 6.15.3

li .abu bopi’i xy. bote’a re su’i by. bopi’i xy. su’i cy.  
the-number a times x to-power 2 plus b times x plus c  
 $ax^2 + bx + c$

An alternative to “li” is “me’o”, also of selma’o LI. Number expressions beginning with “me’o” refer to the actual expression, rather than its value. Thus Example 6.15.1 and Example 6.15.2 above have the same meaning, the number four, whereas

### Example 6.15.4

me’o vo  
the-expression four  
4

and

### Example 6.15.5

me’o re su’i re  
the-expression two plus two  
 $2 + 2$

refer to different pieces of text.

The implicit quantifier for numbers and mathematical expressions is “su’o”, because these sumti are analogous to “lo” descriptions: they refer to things which actually are numbers or pieces of text. In the case of numbers (with “li”), this is a distinction without a difference, as there is only one number which is 4; but there are many texts 4, as many as there are documents in which that numeral appears.





## Brevity Is the Soul of Language: Pro-sumti and Pro-bridu



### 7.1 What are pro-sumti and pro-bridu? What are they for?

Speakers of Lojban, like speakers of other languages, require mechanisms of abbreviation. If every time we referred to something, we had to express a complete description of it, life would be too short to say what we have to say. In English, we have words called *pronouns* which allow us to replace nouns or noun phrases with shorter terms. An English with no pronouns might look something like this:

#### Example 7.1.1

Speakers of Lojban, like speakers of other languages, require mechanisms of abbreviation. If every time speakers of Lojban referred to a thing to which speakers of Lojban refer, speakers

of Lojban had to express a complete description of what speakers of Lojban referred to, life would be too short to say what speakers of Lojban have to say.

Speakers of this kind of English would get mightily sick of talking. Furthermore, there are uses of pronouns in English which are independent of abbreviation. There is all the difference in the world between:

**Example 7.1.2**

John picked up a stick and shook it.

and

**Example 7.1.3**

John picked up a stick and shook a stick.

Example 7.1.3 does not imply that the two sticks are necessarily the same, whereas Example 7.1.2 requires that they are.

In Lojban, we have sumti rather than nouns, so our equivalent of pronouns are called by the hybrid term *pro-sumti*. A purely Lojban term would be “sumti cmavo”: all of the pro-sumti are cmavo belonging to selma’o KOhA. In exactly the same way, Lojban has a group of cmavo (belonging to selma’o GOhA) which serve as selbri or full bridi. These may be called *pro-bridi* or “bridi cmavo”. This chapter explains the uses of all the members of selma’o KOhA and GOhA. They fall into a number of groups, known as series: thus, in selma’o KOhA, we have among others the mi-series, the ko’a-series, the da-series, and so on. In each section, a series of pro-sumti is explained, and if there is a corresponding series of pro-bridi, it is explained and contrasted. Many pro-sumti series don’t have pro-bridi analogues, however.

A few technical terms: The term *referent* means the thing to which a pro-sumti (by extension, a pro-bridi) refers. If the speaker of a sentence is James, then the referent of the word “I” is James. On the other hand, the term *antecedent* refers to a piece of language which a pro-sumti (or pro-bridi) implicitly repeats. In

**Example 7.1.4**

John loves himself

the antecedent of “himself” is “John”; not the person, but a piece of text (a name, in this case). John, the person, would be the referent of “himself”. Not all pro-sumti or pro-bridi have antecedents, but all of them have referents.

## 7.2 Personal pro-sumti: the mi-series

The following cmavo are discussed in this section:

**Definition 7.1**

<i>mi</i>	I, me	<i>KOhA</i> , mi-series
<i>do</i>	you	<i>KOhA</i> , mi-series
<i>mi'o</i>	you and I	<i>KOhA</i> , mi-series
<i>mi'a</i>	I and others, we but not you	<i>KOhA</i> , mi-series

<i>ma'a</i>	you and I and others	<i>KOhA</i> , mi-series
<i>do'o</i>	you and others	<i>KOhA</i> , mi-series
<i>ko</i>	you-imperative	<i>KOhA</i> , mi-series

The mi-series of pro-sumti refer to the speaker, the listener, and others in various combinations. “mi” refers to the speaker and perhaps others for whom the speaker speaks; it may be a Lojbanic mass. “do” refers to the listener or listeners. Neither “mi” nor “do” is specific about the number of persons referred to; for example, the foreman of a jury may refer to the members of the jury as “mi”, since in speaking officially he represents all of them.

The referents of “mi” and “do” are usually obvious from the context, but may be assigned by the vocative words of selma'o COI, explained in Chapter 13. The vocative “mi'e” assigns “mi”, whereas all of the other vocatives assign “do”.

**Example 7.2.1**

mi'e djan. doi frank.  
 mi cusku lu mi bajra li'u do  
 I-am John, O Frank,  
 I express *<quote>* I run *<unquote>* to-you  
 I am John, Frank; I tell you “I run”.

The cmavo “mi'o”, “mi'a”, “ma'a”, and “do'o” express various combinations of the speaker and/or the listener and/or other people: “mi'o” includes only the speaker and the listener but no one else; “mi'a” includes the speaker and others but excludes the listener; “do'o” includes the listener and others but excludes the speaker; “ma'a” includes all three: speaker, listener, others. All of these pro-sumti represent masses. For example, “mi'o” is the same as “mi joi do”, the mass of me and you considered jointly. In English, “we” can mean “mi” or “mi'o” or “mi'a” or even “ma'a”, and English-speakers often suffer because they mistake “mi'o” for “mi'a”:

**Example 7.2.2**

We're going to the store.

Does this include the listener or not? There's no way to be sure.

Finally, the cmavo “ko” is logically equivalent to “do”; its referent is the listener. However, its use alters an assertion about the listener into a command to the listener to make the assertion true:

**Example 7.2.3**

do klama le zarci  
 You go to-the store.

becomes:

**Example 7.2.4**

ko klama le zarci  
 You *<imperative>* go to-the store.  
 Make “you go to the store” true!  
 Go to the store!

In English, the subject of a command is omitted, but in Lojban, the word “ko” must be used. However, “ko” does not have to appear in the  $x_1$  place:

**Example 7.2.5**

mi viska ko  
 I see you *<imperative>*  
 Make “I see you” true!  
 Be seen by me!

In Example 7.2.5, it is necessary to make the verb passive in English in order to convey the effect of “ko” in the  $x_2$  place. Indeed, “ko” does not even have to be a sumti of the main bridi:

**Example 7.2.6**

mi viska le prenu poi prami ko  
 I see the person that loves you *<imperative>*  
 Make “I see the person that loves you” true!  
 Be such that the person who loves you is seen by me!  
 Show me the person who loves you!

As mentioned in Section 7.1, some pro-sumti series have corresponding pro-bridi series. However, there is no equivalent of the mi-series among pro-bridi, since a person isn’t a relationship.

## 7.3 Demonstrative pro-sumti: the ti-series

The following cmavo are discussed in this section:

**Definition 7.2**

<i>ti</i>	this here, a nearby object	<i>KOhA</i> , ti-series
<i>ta</i>	that there, a medium-distant object	<i>KOhA</i> , ti-series
<i>tu</i>	that yonder, a far-distant object	<i>KOhA</i> , ti-series

It is often useful to refer to things by pointing to them or by some related non-linguistic mechanism. In English, the words “this” and “that” serve this function among others: “this” refers to something pointed at that is near the speaker, and “that” refers to something further away. The Lojban pro-sumti of the ti-series serve the same functions, but more narrowly. The cmavo “ti”, “ta”, and “tu” provide only the pointing function of “this” and “that”; they are not used to refer to things that cannot be pointed at.

There are three pro-sumti of the ti-series rather than just two because it is often useful to distinguish between objects that are at more than two different distances. Japanese, among other languages, regularly does this. Until the 16<sup>th</sup> century, English did too; the pronoun “that” referred to something at a medium distance from the speaker, and the now-archaic pronoun “yon” to something far away.

In conversation, there is a special rule about “ta” and “tu” that is often helpful in interpreting them. When used contrastingly, “ta” refers to something that is near the listener, whereas “tu” refers to something far from both speaker and listener. This makes for a parallelism between “ti” and “mi”, and “ta” and “do”, that is convenient when pointing is not possible; for example, when talking by telephone. In written text, on the other hand, the meaning of the

ti-series is inherently vague; is the writer to be taken as pointing to something, and if so, to what? In all cases, what counts as “near” and “far away” is relative to the current situation.

It is important to distinguish between the English pronoun “this” and the English adjective “this” as in “this boat”. The latter is not represented in Lojban by “ti”:

**Example 7.3.1**

le ti bloti  
the this boat

does not mean “this boat” but rather “this one’s boat”, “the boat associated with this thing”, as explained in Chapter 8. A correct Lojban translation of Example 7.3.1 is

**Example 7.3.2**

le vi bloti  
the here boat  
the nearby boat

using a spatial tense before the selbri “bloti” to express that the boat is near the speaker. (Tenses are explained in full in Chapter 11.) Another correct translation would be:

**Example 7.3.3**

ti noi bloti  
this-thing which-incidentally is-a-boat

There are no demonstrative pro-bridji to correspond to the ti-series: you can’t point to a relationship.

## 7.4 Utterance pro-sumti: the di’u-series

The following cmavo are discussed in this section:

**Definition 7.3**

<i>di’u</i>	the previous utterance	<i>KOhA</i> , di’u-series
<i>de’u</i>	an earlier utterance	<i>KOhA</i> , di’u-series
<i>da’u</i>	a much earlier utterance	<i>KOhA</i> , di’u-series
<i>di’e</i>	the next utterance	<i>KOhA</i> , di’u-series
<i>de’e</i>	a later utterance	<i>KOhA</i> , di’u-series
<i>da’e</i>	a much later utterance	<i>KOhA</i> , di’u-series
<i>dei</i>	this very utterance	<i>KOhA</i> , di’u-series
<i>do’i</i>	some utterance	<i>KOhA</i> , di’u-series

The cmavo of the di’u-series enable us to talk about things that have been, are being, or will be said. In English, it is normal to use “this” and “that” for this (indeed, the immediately preceding “this” is an example of such a usage):

**Example 7.4.1**

You don’t like cats.  
That is untrue.

Here “that” does not refer to something that can be pointed to, but to the preceding sentence “You don’t like cats”. In Lojban, therefore, Example 7.4.1 is rendered:

**Example 7.4.2**

do na nelci loi mlatu  
 .i di'u jitfa jufra  
 You not like the-mass-of cats.  
 The-previous-utterance is-a-false sentence..

Using “ta” instead of “di'u” would cause the listener to look around to see what the speaker of the second sentence was physically pointing to.

As with “ti”, “ta”, and “tu”, the cmavo of the di'u-series come in threes: a close utterance, a medium-distance utterance, and a distant utterance, either in the past or in the future. It turned out to be impossible to use the *i/a/u* vowel convention discussed in Section 7.3 without causing collisions with other cmavo, and so the di'u-series has a unique *i/e/a* convention in the first vowel of the cmavo.

Most references in speech are to the past (what has already been said), so “di'e”, “de'e”, and “da'e” are not very useful when speaking. In writing, they are frequently handy:

**Example 7.4.3**

la saimn. cusku di'e  
 Simon expresses the-following-utterance.  
 Simon says:

Example 7.4.3 would typically be followed by a quotation. Note that although presumably the quotation is of something Simon has said in the past, the quotation utterance itself would appear after Example 7.4.3, and so “di'e” is appropriate.

The remaining two cmavo, “dei” and “do'i”, refer respectively to the very utterance that the speaker is uttering, and to some vague or unspecified utterance uttered by someone at some time:

**Example 7.4.4**

dei jetnu jufra  
 This-utterance is-a-true sentence.  
 What I am saying (at this moment) is true.

**Example 7.4.5**

do'i jetnu jufra  
 Some-utterance is-a-true sentence.  
 That's true (where “that” is not necessarily what was just said).

The cmavo of the di'u-series have a meaning that is relative to the context. The referent of “dei” in the current utterance is the same as the referent of “di'u” in the next utterance. The term *utterance* is used rather than *sentence* because the amount of speech or written text referred to by any of these words is vague. Often, a single *bridi* is intended, but longer utterances may be thus referred to.

Note one very common construction with “di'u” and the cmavo “la'e” (of *selma'o LAhE*; see Chapter 6) which precedes a sumti and means “the thing referred to by (the sumti)”:

**Example 7.4.6**

mi prami la djein.  
 .i mi nelci la'e di'u  
 I love Jane.  
 And I like the-referent-of the-last-utterance.  
 I love Jane, and I like that.

The effect of “la'e di'u” in Example 7.4.6 is that the speaker likes, not the previous sentence, but rather the state of affairs referred to by the previous sentence, namely his loving Jane. This cmavo compound is often written as a single word: “la'edi'u”. It is important not to mix up “di'u” and “la'edi'u”, or the wrong meaning will generally result:

**Example 7.4.7**

mi prami la djein.  
 .i mi nelci di'u  
 I love Jane.  
 And I like the-last-utterance.

says that the speaker likes one of his own sentences. There are no pro-bridi corresponding to the di'u-series.

## 7.5 Assignable pro-sumti and pro-bridi: the ko'a-series and the broda-series

The following cmavo and gismu are discussed in this section:

**Definition 7.4**

<i>ko'a</i>	<i>it</i> <sub>1</sub>	<i>KOhA</i> , ko'a-series
<i>ko'e</i>	<i>it</i> <sub>2</sub>	<i>KOhA</i> , ko'a-series
<i>ko'i</i>	<i>it</i> <sub>3</sub>	<i>KOhA</i> , ko'a-series
<i>ko'o</i>	<i>it</i> <sub>4</sub>	<i>KOhA</i> , ko'a-series
<i>ko'u</i>	<i>it</i> <sub>5</sub>	<i>KOhA</i> , ko'a-series
<i>fo'a</i>	<i>it</i> <sub>6</sub>	<i>KOhA</i> , ko'a-series
<i>fo'e</i>	<i>it</i> <sub>7</sub>	<i>KOhA</i> , ko'a-series
<i>fo'i</i>	<i>it</i> <sub>8</sub>	<i>KOhA</i> , ko'a-series
<i>fo'o</i>	<i>it</i> <sub>9</sub>	<i>KOhA</i> , ko'a-series
<i>fo'u</i>	<i>it</i> <sub>10</sub>	<i>KOhA</i> , ko'a-series
<i>broda</i>	<i>is</i> <sub>1</sub>	<i>BRIVLA</i> , broda-series
<i>brode</i>	<i>is</i> <sub>2</sub>	<i>BRIVLA</i> , broda-series
<i>brodi</i>	<i>is</i> <sub>3</sub>	<i>BRIVLA</i> , broda-series
<i>brodo</i>	<i>is</i> <sub>4</sub>	<i>BRIVLA</i> , broda-series
<i>brodu</i>	<i>is</i> <sub>5</sub>	<i>BRIVLA</i> , broda-series
<i>goi</i>	pro-sumti assignment	<i>GOI</i>
<i>cei</i>	pro-bridi assignment	<i>CEI</i>

The discussion of personal pro-sumti in Section 7.2 may have seemed incomplete. In English, the personal pronouns include not only “I” and “you” but also “he”, “she”, “it”, and

“they”. Lojban does have equivalents of this latter group: in fact, it has more of them than English does. However, they are organized and used very differently.

There are ten cmavo in the ko’a-series, and they may be assigned freely to any sumti whatsoever. The English word “he” can refer only to males, “she” only to females (and ships and a few other things), “it” only to inanimate things, and “they” only to plurals; the cmavo of the ko’a-series have no restrictions at all. Therefore, it is almost impossible to guess from the context what ko’a-series cmavo might refer to if they are just used freely:

**Example 7.5.1**

la .alis. klama le zarci .i ko’a blanu  
Alice goes-to the store. *it*<sub>1</sub> is-blue.

The English gloss *it*<sub>1</sub>, plus knowledge about the real world, would tend to make English-speakers believe that “ko’a” refers to the store; in other words, that its antecedent is “le zarci”. To a Lojbanist, however, “la .alis.” is just as likely an antecedent, in which case Example 7.5.1 means that Alice, not the store, is blue.

To avoid this pitfall, Lojban employs special syntax, using the cmavo “goi”:

**Example 7.5.2**

la .alis. klama le zarci  
.i ko’a goi la .alis. cu blanu  
Alice goes-to the store.  
*it*<sub>1</sub>, also-known-as Alice, is-blue.

Syntactically, “goi la .alis.” is a relative phrase (relative phrases are explained in Chapter 8). Semantically, it says that “ko’a” and “la .alis.” refer to the same thing, and furthermore that this is true because “ko’a” is being defined as meaning “la .alis.”. It is equally correct to say:

**Example 7.5.3**

la .alis. klama le zarci  
.i la .alis. goi ko’a cu blanu  
Alice goes-to the store.  
Alice, also-known-as *it*<sub>1</sub>, is-blue.

in other words, “goi” is symmetrical. There is a terminator, “ge’u” (of selma’o GEhU), which is almost always elidable. The details are in Chapter 8.

The afterthought form of “goi” shown in Example 7.5.2 and Example 7.5.3 is probably most common in speech, where we do not know until part way through our utterance that we will want to refer to Alice again. In writing, though, “ko’a” may be assigned at the point where Alice is first mentioned. An example of this forethought form of “goi” is:

**Example 7.5.4**

la .alis. goi ko’a klama le zarci  
.i ko’a cu blanu  
Alice, also-known-as *it*<sub>1</sub>, goes-to the store.  
*it*<sub>1</sub> is-blue.

Again, “ko’a goi la .alis.” would have been entirely acceptable in Example 7.5.4. This last form is reminiscent of legal jargon: “The party of the first part, hereafter known as Buyer, ...”.



Just as the ko'a-series of pro-sumti allows a substitute for a sumti which is long or complex, or which for some other reason we do not want to repeat, so the broda-series of pro-bridi allows a substitute for a selbri or even a whole bridi:

**Example 7.5.5**

ti slasi je mlatu bo cidja lante gacri cei broda  
 .i le crino broda cu barda  
 .i le xunre broda cu cmalu  
 These are plastic cat-food can covers, or thingies.  
 The green thingy is large.  
 The red thingy is small.

The pro-bridi “broda” has as its antecedent the selbri “slasi je mlatu bo cidja lante gacri”. The cmavo “cei” performs the role of “goi” in assigning “broda” to this long phrase, and “broda” can then be used just like any other brivla. (In fact, “broda” and its relatives actually *are* brivla: they are gismu in morphology, although they behave exactly like the members of selma'o GOhA. The reasons for using gismu rather than cmavo are buried in the Loglan Project's history.)

Note that *pro-bridi* are so-called because, even though they have the grammar of selbri, their antecedents are whole bridi. In the following rather contrived example, the antecedent of “brode” is the whole bridi “mi klama le zarci”:

**Example 7.5.6**

mi klama cei brode le zarci .i do brode  
 I go-to (which-is *claim*<sub>1</sub>) the store. You *claim*<sub>1</sub>  
 I go to the store. You, too.

In the second bridi, “do brode” means “do klama le zarci”, because “brode” carries the  $x_2$  sumti of “mi klama le zarci” along with it. It also potentially carries the  $x_1$  sumti as well, but the explicit  $x_1$  sumti “do” overrides the “mi” of the antecedent bridi. (Similarly, any tense or negation that is present in the antecedent is also carried, and can be overridden by explicit tense or negation cmavo on the pro-bridi.) These rules hold for all pro-bridi that have antecedents.

Another use of “broda” and its relatives, without assignment, is as “sample gismu”:

**Example 7.5.7**

broda ke brode brodi  
 a *thing*<sub>1</sub> type of (*thing*<sub>2</sub> type-of *thing*<sub>3</sub>)

represents an abstract pattern, a certain kind of tanru. (Historically, this use was the original one.)

As is explained in Chapter 17, the words for Lojban letters, belonging to selma'o BY and certain related selma'o, are also usable as assignable pro-sumti. The main difference between letter pro-sumti and ko'a-series pro-sumti is that, in the absence of an explicit assignment, letters are taken to refer to the most recent name or description sumti beginning with the same letter:

**Example 7.5.8**

mi viska le gerku .i gy. cusku zo arf.  
 I see the dog. *D* expresses the-word “Arf!”.

The Lojban word “gerku” begins with *g*, so the antecedent of “gy.”, the cmavo for the letter *g*, must be “le gerku”. In the English translation, we use the same principle to refer to the dog as “D”. Of course, in case of ambiguity, “goi” can be used to make an explicit assignment.

Furthermore, “goi” can even be used to assign a name:

**Example 7.5.9**

le ninmu goi la sam. cu klama le zarci  
 The woman also-known-as Sam goes to-the store.  
 The woman, whom I’ll call Sam, goes to the store.

This usage does not imply that the woman’s name is Sam, or even that the speaker usually calls the woman “Sam”. “Sam” is simply a name chosen, as if at random, for use in the current context only.

## 7.6 Anaphoric pro-sumti and pro-brididi: the *ri*-series and the *go’i*-series

The following cmavo are discussed in this section:

**Definition 7.5**

<i>ri</i>	(repeats last sumti)	<i>KOhA</i> , <i>ri</i> -series
<i>ra</i>	(repeats previous sumti)	<i>KOhA</i> , <i>ri</i> -series
<i>ru</i>	(repeats long-ago sumti)	<i>KOhA</i> , <i>ri</i> -series
<i>go’i</i>	(repeats last brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>go’a</i>	(repeats previous brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>go’u</i>	(repeats long-ago brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>go’e</i>	(repeats last-but-one brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>go’o</i>	(repeats future brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>nei</i>	(repeats current brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>no’a</i>	(repeats outer brididi)	<i>GOhA</i> , <i>go’i</i> -series
<i>ra’o</i>	pro-cmavo update	<i>RAhO</i>

The term *anaphora* literally means “repetition”, but is used in linguistics to refer to pronouns whose significance is the repetition of earlier words, namely their antecedents. Lojban provides three pro-sumti anaphora, “*ri*”, “*ra*”, and “*ru*”; and three corresponding pro-brididi anaphora, “*go’i*”, “*go’a*”, and “*go’u*”. These cmavo reveal the same vowel pattern as the *ti*-series, but the “distances” referred to are not physical distances, but distances from the anaphoric cmavo to its antecedent.

The cmavo “*ri*” is the simplest of these; it has the same referent as the last complete sumti appearing before the “*ri*”:

**Example 7.6.1**

la .alis. sipna le ri kumfa  
 Alice sleeps-in the of-*(repeat last sumti)* room.  
 Alice sleeps in her room.

The “*ri*” in Example 7.6.1 is equivalent to repeating the last sumti, which is “*la .alis.*”, so Example 7.6.1 is equivalent to:

**Example 7.6.2**

la .alis. sipna le la .alis. kumfa  
 Alice sleeps-in the of-Alice room.  
 Alice sleeps in Alice's room.

Note that “ri” does not repeat “le ri kumfa”, because that sumti is not yet complete when “ri” appears. This prevents “ri” from getting entangled in paradoxes of self-reference. (There are plenty of other ways to do that!) Note also that sumti within other sumti, as in quotations, abstractions, and the like, are counted in the order of their beginnings; thus a lower level sumti like “la alis.” in Example 7.6.2 is considered to be more recent than a higher level sumti that contains it.

Certain sumti are ignored by “ri”; specifically, most of the other cmavo of KOhA, and the almost-grammatically-equivalent lerfu words of selma'o BY. It is simpler just to repeat these directly:

**Example 7.6.3**

mi prami mi  
 I love me.  
 I love myself.

However, the cmavo of the ti-series can be picked up by “ri”, because you might have changed what you are pointing at, so repeating “ti” may not be effective. Likewise, “ri” itself (or rather its antecedent) can be repeated by a later “ri”; in fact, a string of “ri” cmavo with no other intervening sumti always all repeat the same sumti:

**Example 7.6.4**

la djan. viska le tricu  
 .i ri se jadni le ri jimca  
 John sees the tree.  
 ⟨repeat last⟩ is-adorned-by the of-⟨repeat last⟩ branch  
 John sees the tree. It is adorned by its branches.

Here the second “ri” has as antecedent the first “ri”, which has as antecedent “le tricu”. All three refer to the same thing: a tree.

To refer to the next-to-last sumti, the third-from-last sumti, and so on, “ri” may be subscripted (subscripts are explained in Chapter 19):

**Example 7.6.5**

lo smuci .i lo forca .i la rik. pilno rixire  
 .i la .alis. pilno riximu  
 A spoon. A fork. Rick uses ⟨repeat next-to-last⟩.  
 Alice uses ⟨repeat fifth-from-last⟩.

Here “rixire”, or  $ri_2$ , skips “la rik.” to reach “lo forca”. In the same way, “riximu”, or  $ri_5$ , skips “la .alis.”, “rixire”, “la rik.”, and “lo forca” to reach “lo smuci”. As can clearly be seen, this procedure is barely practicable in writing, and would break down totally in speech.

Therefore, the vaguer “ra” and “ru” are also provided. The cmavo “ra” repeats a recently used sumti, and “ru” one that was further back in the speech or text. The use of “ra” and “ru” forces the listener to guess at the referent, but makes life easier for the speaker. Can “ra” refer

to the last sumti, like “ri”? The answer is no if “ri” has also been used. If “ri” has not been used, then “ra” might be the last sumti. Likewise, if “ra” has been used, then any use of “ru” would repeat a sumti earlier than the one “ra” is repeating. A more reasonable version of Example 7.6.5, but one that depends more on context, is:

**Example 7.6.6**

lo smuci .i lo forca .i la rik. pilno ra  
 .i la .alis. pilno ru  
 A spoon. A fork. Rick uses *<some previous thing>*.  
 Alice uses *<some more remote thing>*.

In Example 7.6.6, the use of “ra” tells us that something other than “la rik.” is the antecedent; “lo forca” is the nearest sumti, so it is probably the antecedent. Similarly, the antecedent of “ru” must be something even further back in the utterance than “lo forca”, and “lo smuci” is the obvious candidate.

The meaning of “ri” must be determined every time it is used. Since “ra” and “ru” are more vaguely defined, they may well retain the same meaning for a while, but the listener cannot count on this behavior. To make a permanent reference to something repeated by “ri”, “ra”, or “ru”, use “goi” and a ko’a-series cmavo:

**Example 7.6.7**

la .alis. klama le zarci  
 .i ri goi ko’a blanu  
 Alice goes-to the store.  
 It-last-mentioned also-known-as *it<sub>1</sub>* is-blue.

allows the store to be referred to henceforth as “ko’a” without ambiguity. Example 7.6.7 is equivalent to Example 7.5.1 and eliminates any possibility of “ko’a” being interpreted by the listener as referring to Alice.

The cmavo “go’i”, “go’a”, and “go’u” follow exactly the same rules as “ri”, “ra”, and “ru”, except that they are pro-bridj, and therefore repeat bridj, not sumti — specifically, main sentence bridj. Any bridj that are embedded within other bridj, such as relative clauses or abstractions, are not counted. Like the cmavo of the broda-series, the cmavo of the go’i-series copy all sumti with them. This makes “go’i” by itself convenient for answering a question affirmatively, or for repeating the last bridj, possibly with new sumti:

**Example 7.6.8**

xu zo djan. cmene do  
 .i go’i  
*<True-false?>* The-word “John” is-the-name of you?  
*<repeat last bridj>*.  
 Is John your name? Yes.

**Example 7.6.9**

mi klama le zarci .i do go’i  
 I go-to the store. You *<repeat last bridj>*.  
 I go to the store. You, too.

Note that Example 7.6.9 means the same as Example 7.5.6, but without the bother of assigning an actual broda-series word to the first bridj. For long-term reference, use “go’i cei broda” or the like, analogously to “ri goi ko’a” in Example 7.6.7.

The remaining four cmavo of the go'i-series are provided for convenience or for achieving special effects. The cmavo "go'e" means the same as "go'ixire": it repeats the last bridi but one. This is useful in conversation:

**Example 7.6.10**

*a*: mi ba klama le zarci  
*b*: mi nelci le si'o mi go'i  
*a*: do go'e  
*a*: I ⟨future⟩ go-to the store.  
*b*: I like the concept-of I ⟨repeat last bridi⟩.  
*a*: You ⟨repeat last bridi but one⟩.  
*a*: I am going to the store.  
*b*: I like the idea of my going.  
*a*: You'll go, too.

Here *b*'s sentence repeats *a*'s within an abstraction (explained in Chapter 11): "le si'o mi go'i" means "le si'o mi klama le zarci". Why must *b* use the word "mi" explicitly to replace the  $x_1$  of "mi klama le zarci", even though it looks like "mi" is replacing "mi"? Because *b*'s "mi" refers to *b*, whereas *a*'s "mi" refers to *a*. If *b* said:

**Example 7.6.11**

mi nelci le si'o go'i

that would mean: "I like the idea of your going to the store". The repetition implied by "go'i" is not literally by words, but by concepts. Finally, *a* repeats her own sentence, but with the  $x_1$  changed to "do", meaning *b*. Note that in Example 7.6.10, the tense "ba" (future time) is carried along by both "go'i" and "go'e". Descriptions based on go'i-series cmavo can be very useful for repeating specific sumti of previous bridi:

**Example 7.6.12**

le xekri mlatu cu klama le zarci  
 .i le go'i cu cadzu le bisli  
 The black cat goes-to the store.  
 That-described-as-the- $x_1$ -place-of ⟨repeat last bridi⟩ walks-on the ice.  
 The black cat goes to the store. It walks on the ice.

Here the "go'i" repeats "le xekri mlatu cu klama le zarci", and since "le" makes the  $x_1$  place into a description, and the  $x_1$  place of this bridi is "le xekri mlatu", "le go'i" means "le xekri mlatu".

The cmavo "go'o", "nei", and "no'a" have been little used so far. They repeat respectively some future bridi, the current bridi, and the bridi that encloses the current bridi ("no'a", unlike the other members of the go'i-series, can repeat non-sentence bridi). Here are a few examples:

**Example 7.6.13**

mi nupre le nu mi go'o  
 .i ba dunda le djini le bersa  
 .i ba dunda le zdani le tixnu  
 I promise the event-of I ⟨repeat future bridi⟩  
 ⟨Future⟩ give the money to-the son

⟨*Future*⟩ give the house to-the daughter  
 I promise to do the following:  
     Give the money to my son.  
     Give the house to my daughter.

(Note: The Lojban does not contain an equivalent of the “my” in the colloquial English; it leaves the fact that it is the speaker’s son and daughter that are referred to implicit. To make the fact explicit, use “le bersa/tixnu be mi”.)

For good examples of “nei” and “no’a”, we need nested bridi contexts:

**Example 7.6.14**

mi se pluka le nu do pensi  
     le nu nei kei pu le nu do zakte  
 I am-pleased-by the event-of (you think-about  
     (the event-of ⟨*main bridi*⟩) before the-event of (your acting).  
 I am pleased that you thought about whether I  
     would be pleased (about ...) before you acted.

**Example 7.6.15**

mi ba klama ca le nu  
     do no’a  
 I ⟨*future*⟩ go ⟨*present*⟩ the event-of  
     you ⟨*repeats outer bridi*⟩  
 I will go when you do.

Finally, “ra’o” is a cmavo that can be appended to any go’i-series cmavo, or indeed any cmavo of selma’o GOhA, to signal that pro-sumti or pro-bridi cmavo in the antecedent are to be repeated literally and reinterpreted in their new context. Normally, any pro-sumti used within the antecedent of the pro-bridi keep their meanings intact. In the presence of “ra’o”, however, their meanings must be reinterpreted with reference to the new environment. If someone says to you:

**Example 7.6.16**

mi ba lumci lemi karca  
 I will wash my car.

you might reply either:

**Example 7.6.17**

mi go’i  
 I will wash your car.

or:

**Example 7.6.18**

mi go’i ra’o  
 I will wash my car.

The “ra’o” forces the second “mi” from the original bridi to mean the new speaker rather than the former speaker. This means that “go’e ra’o” would be an acceptable alternative to “do go’e” in B’s statement in Example 7.6.10.

The anaphoric pro-sumti of this section can be used in quotations, but never refer to any of the supporting text outside the quotation, since speakers presumably do not know that they may be quoted by someone else.

However, a “ri”-series or “go’a”-series reference within a quotation can refer to something mentioned in an earlier quotation if the two quotations are closely related in time and context. This allows a quotation to be broken up by narrative material without interfering with the pro-sumti within it. Here’s an example:

**Example 7.6.19**

la djan. cusku lu mi klama le zarci li’u  
 .i la .alis. cusku lu mi go’i li’u  
 John says *<quote>* I go-to the store *<unquote>*.  
 Alice says *<quote>* I *<repeat>* *<unquote>*.  
 John says, “I am going to the store.”  
 Alice says, “Me too.”

Of course, there is no problem with narrative material referring to something within a quotation: people who quote, unlike people who are quoted, are aware of what they are doing.

## 7.7 Indefinite pro-sumti and pro-bridi: the zo’e-series and the co’e-series

The following cmavo are discussed in this section:

**Definition 7.6**

<i>zo’e</i>	the obvious value	<i>KOhA</i> , zo’e-series
<i>zu’i</i>	the typical value	<i>KOhA</i> , zo’e-series
<i>zi’o</i>	the nonexistent value	<i>KOhA</i> , zo’e-series
<i>co’e</i>	has the obvious relationship	<i>GOhA</i> , co’e-series

The cmavo of the zo’e-series represent indefinite, unspecified sumti. The cmavo “zo’e” represents an elliptical value for this sumti place; it is the optional spoken place holder when a sumti is skipped without being specified. Note that the elliptical value is not always the typical value. The properties of ellipsis lead to an elliptical sumti being defined as “whatever I want it to mean but haven’t bothered to figure out, or figure out how to express”. The cmavo “zu’i”, on the other hand, represents the typical value for this place of this bridi:

**Example 7.7.1**

mi klama le bartu be le zdani le nenri be le zdani zu’i zu’i  
 I go to-the outside of the house from-the inside of the house *<by-typical-route>* *<by-typical-means>*

In Example 7.7.1, the first “zu’i” probably means something like “by the door”, and the second “zu’i” probably means something like “on foot”, those being the typical route and means

for leaving a house. On the other hand, if you are at the top of a high rise during a fire, neither “zu’i” is appropriate. It’s also common to use “zu’i” in “by standard” places.

Finally, the cmavo “zi’o” represents a value which does not even exist. When a bridri fills one of its places with “zi’o”, what is really meant is that the selbri has a place which is irrelevant to the true relationship the speaker wishes to express. For example, the place structure of “zbasu” is actor  $x_1$  makes  $x_2$  from materials  $x_3$ . Consider the sentence “Living things are made from cells”. This cannot be correctly expressed as:

**Example 7.7.2**

loi jmive cu se zbasu ⟨zo’e⟩ fi loi selci  
The-mass-of living-things is-made ⟨by-something⟩ from the-mass-of cells

because the “zo’e”, expressed or understood, in Example 7.7.2 indicates that there is still a “maker” in this relationship. We do not generally suppose, however, that someone “makes” living things from cells. The best answer is probably to find a different selbri, one which does not imply a “maker”: however, an alternative strategy is to use “zi’o” to eliminate the maker place:

**Example 7.7.3**

loi jmive cu se zbasu zi’o loi selci  
The-mass-of living-things is-made ⟨without-maker⟩ from the-mass-of cells.

Note: The use of “zi’o” to block up, as it were, one place of a selbri actually creates a new selbri with a different place structure. Consider the following examples:

**Example 7.7.4**

mi zbasu le dinju loi mudri  
I make the building from-some-of-the-mass-of wood.  
I make the building out of wood.

**Example 7.7.5**

zi’o zbasu le dinju loi mudri  
⟨without-maker⟩ makes the building from-some-of-the-mass-of wood.  
The building is made out of wood.

**Example 7.7.6**

mi zbasu zi’o loi mudri  
I make ⟨without-thing-made⟩ from-some-of-the-mass-of wood.  
I build using wood.

**Example 7.7.7**

mi zbasu loi mudri zi’o  
I make the building ⟨without-material⟩.  
I make the building.

If Example 7.7.4 is true, then Example 7.7.5 through Example 7.7.7 must be true also. However, Example 7.7.3 does not correspond to any sentence with three regular (non-“zi’o”) sumti.

The pro-bridri “co’e” (which by itself constitutes the co’e-series of selma’o GOhA) represents the elliptical selbri. Lojban grammar does not allow the speaker to merely omit a selbri



from a bridi, although any or all sumti may be freely omitted. Being vague about a relationship requires the use of “co’e” as a selbri place-holder:

**Example 7.7.8**

mi troci le nu mi co’e le vorme  
 I try the event-of my *⟨doing-the-obvious-action⟩* to-the door.  
 I try the door.

The English version means, and the Lojban version probably means, that I try to open the door, but the relationship of opening is not actually specified; the Lojbanic listener must guess it from context. Lojban, unlike English, makes it clear that there is an implicit action that is not being expressed.

The form of “co’e” was chosen to resemble “zo’e”; the cmavo “do’e” of selma’o BAI (see Chapter 9) also belongs to the same group of cmavo.

Note that “do’i”, of the di’u-series, is also a kind of indefinite pro-sumti: it is indefinite in referent, but is restricted to referring only to an utterance.

## 7.8 Reflexive and reciprocal pro-sumti: the vo’a-series

The following cmavo are discussed in this section:

**Definition 7.7**

<i>vo’a</i>	$x_1$ of this bridi	<i>KOhA</i> , vo’a-series
<i>vo’e</i>	$x_2$ of this bridi	<i>KOhA</i> , vo’a-series
<i>vo’i</i>	$x_3$ of this bridi	<i>KOhA</i> , vo’a-series
<i>vo’o</i>	$x_4$ of this bridi	<i>KOhA</i> , vo’a-series
<i>vo’u</i>	$x_5$ of this bridi	<i>KOhA</i> , vo’a-series
<i>soi</i>	reciprocity	<i>SOI</i>
<i>se’u</i>	soi terminator	<i>SEhU</i>

The cmavo of the vo’a-series are pro-sumti anaphora, like those of the ri-series, but have a specific function. These cmavo refer to the other places of the same bridi; the five of them represent up to five places. The same vo’a-series cmavo mean different things in different bridi. Some examples:

**Example 7.8.1**

mi lumci vo’a  
 I wash myself

**Example 7.8.2**

mi klama le zarci vo’e  
 I go to the store from itself *⟨by some route unspecified⟩*.

To refer to places of neighboring bridi, constructions like “le se go’i ku” do the job: this refers to the 2<sup>nd</sup> place of the previous main bridi, as explained in Section 7.6.

The cmavo of the vo’a-series are also used with “soi” (of selma’o SOI) to precisely express reciprocity, which in English is imprecisely expressed with a discursive phrase like “vice versa”:

**Example 7.8.3**

mi prami do soi vo'a vo'e  
 I love you *<reciprocity>* *<x<sub>1</sub> of this bridi>* *<x<sub>2</sub> of this bridi>*.  
 I love you and vice versa (swapping “I” and “you”).

The significance of “soi vo'a vo'e” is that the bridi is still true even if the  $x_1$  (specified by “vo'a”) and the  $x_2$  (specified by “vo'e”) places are interchanged. If only a single sumti follows “soi”, then the sumti immediately preceding “soi” is understood to be one of those involved:

**Example 7.8.4**

mi prami do soi vo'a  
 I love you *<reciprocity>* *<x<sub>1</sub> of this bridi>*.

again involves the  $x_1$  and  $x_2$  places.

Of course, other places can be involved, and other sumti may be used in place of vo'a-series cmavo, provided those other sumti can be reasonably understood as referring to the same things mentioned in the bridi proper. Here are several examples that mean the same thing:

**Example 7.8.5**

mi bajra ti ta soi vo'e  
 mi bajra ti ta soi vo'e vo'i  
 soi vo'e vo'i mi bajra ti ta  
 I run to this from that and vice versa (to that from this).

The elidable terminator for “soi” is “se'u” (selma'o SEhU), which is normally needed only if there is just one sumti after the “soi”, and the “soi” construction is not at the end of the bridi. Constructions using “soi” are free modifiers, and as such can go almost anywhere. Here is an example where “se'u” is required:

**Example 7.8.6**

mi bajykla ti soi vo'i se'u ta  
 I runningly-go to-this *<reciprocity>* *<x<sub>3</sub> of this bridi>* from-that  
 I run to this from that and vice versa.

## 7.9 sumti and bridi questions: “ma” and “mo”

The following cmavo are discussed in this section:

**Definition 7.8**

<i>ma</i>	sumti question	<i>KOhA</i>
<i>mo</i>	bridi question	<i>GOhA</i>

Lojban questions are more fully explained in Chapter 19, but “ma” and “mo” are listed in this chapter for completeness. The cmavo “ma” asks for a sumti to make the bridi true:

**Example 7.9.1**

do klama ma  
 You go to-what-destination?  
 Where are you going?

The cmavo “mo”, on the other hand, asks for a selbri which makes the question bridi true. If the answer is a full bridi, then the arguments of the answer override the arguments in the question, in the same manner as the go’i-series cmavo. A simple example is:

**Example 7.9.2**

do mo  
 What predicate is true as applied to you?  
 How are you?  
 What are you doing?  
 What are you?

Example 7.9.3 is a truly pregnant question that will have several meanings depending on context. (One thing it probably does not mean is “Who are you?” in the sense “What is your name/identity?”, which is better expressed by:

**Example 7.9.3**

ma cmene do  
 What sumti is-the-name-of you?  
 What is your name?

or even

**Example 7.9.4**

doi ma  
 O *⟨what sumti?⟩*

which uses the vocative “doi” to address someone, and simultaneously asks who the someone is.) A further example of “mo”:

**Example 7.9.5**

lo mo prenu cu darxi do  
 .i barda  
 A *⟨what selbri?⟩* type-of person hit you?  
 (Observative:) A big thing.  
 Which person hit you? The big one.

When “ma” or “mo” is repeated, multiple questions are being asked simultaneously:

**Example 7.9.6**

ma djuno ma  
*⟨what sumti⟩* knows *⟨what sumti⟩*?  
 Who knows what?

## 7.10 Relativized pro-sumti: “ke’a”

The following cmavo are discussed in this section:

### Definition 7.9

*ke’a*          relativized sumti

*KOhA*

This pro-sumti is used in relative clauses (explained in Chapter 8) to indicate how the sumti being relativized fits within the clause. For example:

### Example 7.10.1

mi catlu lo mlatu poi ⟨*zo’e*⟩ zbasu ke’a lei slasi  
 I see a cat such-that something-unspecified makes the-thing-being-relativized ⟨*the cat*⟩  
 from-some-mass-of plastic.  
 I see a cat made of plastic.

If “ke’a” were omitted from Example 7.10.1, it might be confused with:

### Example 7.10.2

mi catlu lo mlatu poi ⟨*ke’a*⟩ zbasu lei slasi  
 I see a cat such-that the-thing-being-relativized ⟨*the cat*⟩ makes a-mass-of plastic  
 I see a cat that makes plastic.

The anaphora cmavo “ri” cannot be used in place of “ke’a” in Example 7.10.1 and Example 7.10.2, because the relativized sumti is not yet complete when the “ke’a” appears. Note that “ke’a” is used only with relative clauses, and not with other embedded bridi such as abstract descriptions. In the case of relative clauses within relative clauses, “ke’a” may be subscripted to make the difference clear (see Chapter 8).

## 7.11 Abstraction focus pro-sumti: “ce’u”

The following cmavo are discussed in this section:

### Definition 7.10

*ce’u*          abstraction focus

*KOhA*

The cmavo “ce’u” is used within abstraction bridi, particularly property abstractions introduced by the cmavo “ka”. Abstractions, including the uses of “ce’u”, are discussed in full in Chapter 11. In brief: Every property abstraction specifies a property of one of the sumti in it; that sumti place is filled by using “ce’u”. This convention enables us to distinguish clearly between:

### Example 7.11.1

le ka ce’u gleki  
 the property-of (*x* being-happy)  
 the property of being happy  
 happiness

and

**Example 7.11.2**

le ka gleki ce'u  
 the property-of (being-happy about-*x*)  
 the property of being that which someone is happy about

## 7.12 Bound variable pro-sumti and pro-bridi: the da-series and the bu'a-series

The following cmavo are discussed in this section:

**Definition 7.11**

<i>da</i>	<i>something</i> <sub>1</sub>	<i>KOhA</i> , da-series
<i>de</i>	<i>something</i> <sub>2</sub>	<i>KOhA</i> , da-series
<i>di</i>	<i>something</i> <sub>3</sub>	<i>KOhA</i> , da-series
<i>bu'a</i>	<i>predicate</i> <sub>1</sub>	<i>GOhA</i> , bu'a-series
<i>bu'e</i>	<i>predicate</i> <sub>2</sub>	<i>GOhA</i> , bu'a-series
<i>bu'i</i>	<i>predicate</i> <sub>3</sub>	<i>GOhA</i> , bu'a-series

Bound variables belong to the predicate-logic part of Lojban, and are listed here for completeness only. Their semantics is explained in Chapter 16. It is worth mentioning that the Lojban translation of Example 7.1.2 is:

**Example 7.12.1**

la djan. cu lafti da poi grana ku'o gi'e desygau da  
 John raised *something*<sub>1</sub> which is-a-stick and shake-did *something*<sub>1</sub>  
 John picked up a stick and shook it.

## 7.13 Pro-sumti and pro-bridi cancelling

The following cmavo are discussed in this section:

**Definition 7.12**

<i>da'o</i>	cancel all pro-sumti/pro-bridi	<i>DAhO</i>
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How long does a pro-sumti or pro-bridi remain stable? In other words, once we know the referent of a pro-sumti or pro-bridi, how long can we be sure that future uses of the same cmavo have the same referent? The answer to this question depends on which series the cmavo belongs to. Personal pro-sumti are stable until there is a change of speaker or listener, possibly signaled by a vocative. Assignable pro-sumti and pro-bridi last indefinitely or until rebound with “goi” or “cei”. Bound variable pro-sumti and pro-bridi also generally last until re-bound; details are available in Chapter 16.

Utterance pro-sumti are stable only within the utterance in which they appear; similarly, reflexive pro-sumti are stable only within the bridi in which they appear; and “ke'a” is stable only within its relative clause. Anaphoric pro-sumti and pro-bridi are stable only within narrow limits depending on the rules for the particular cmavo.

Demonstrative pro-sumti, indefinite pro-sumti and pro-bridi, and sumti and bridi questions potentially change referents every time they are used.

However, there are ways to cancel all pro-sumti and pro-bridi, so that none of them have known referents. (Some, such as “mi”, will acquire the same referent as soon as they are used again after the cancellation.) The simplest way to cancel everything is with the cmavo “da’o” of selma’o DAhO, which is used solely for this purpose; it may appear anywhere, and has no effect on the grammar of texts containing it. One use of “da’o” is when entering a conversation, to indicate that one’s pro-sumti assignments have nothing to do with any assignments already made by other participants in the conversation.

In addition, the cmavo “ni’o” and “no’i” of selma’o NIhO, which are used primarily to indicate shifts in topic, may also have the effect of canceling pro-sumti and pro-bridi assignments, or of reinstating ones formerly in effect. More explanations of NIhO can be found in Chapter 19.

## 7.14 The identity predicate: du

The following cmavo is discussed in this section:

### Definition 7.13

*du*          identity

GOhA

The cmavo “du” has the place structure:  $x_1$  is identical with  $x_2, x_3, \dots$ , and appears in selma’o GOhA for reasons of convenience: it is not a pro-bridi. “du” serves as mathematical = , and outside mathematical contexts is used for defining or identifying. Mathematical examples may be found in Chapter 18. The main difference between

### Example 7.14.1

ko’a du le nanmu  
*it*<sub>1</sub> is-identical-to the man

and

### Example 7.14.2

ko’a mintu le nanmu  
*it*<sub>1</sub> is-the-same-as the man

is this defining nature. Example 7.14.1 presumes that the speaker is responding to a request for information about what “ko’a” refers to, or that the speaker in some way feels the need to define “ko’a” for later reference. A bridi with “du” is an identity sentence, somewhat metalinguistically saying that all attached sumti are representations for the same referent. There may be any number of sumti associated with “du”, and all are said to be identical.

Example 7.14.2, however, predicates; it is used to make a claim about the identity of “ko’a”, which presumably has been defined previously.

Note: “du” historically is derived from “dunli”, but “dunli” has a third place which “du” lacks: the standard of equality.

## 7.15 **lujvo based on pro-sumti**

There exist rafsi allocated to a few cmavo of selma'o KOhA, but they are rarely used. (See Section 7.16 for a complete list.) The obvious way to use them is as internal sumti, filling in an appropriate place of the gismu or lujvo to which they are attached; as such, they usually stand as the first rafsi in their lujvo.

Thus “donta'a”, meaning “you-talk”, would be interpreted as “tavla be do”, and would have the place structure

### Example 7.15.1

$t_1$  talks to you about subject  $t_3$  in language  $t_4$

since  $t_2$  (the addressee) is already known to be “do”.

On the other hand, the lujvo “donma'o”, literally “you-cmavo”, which means “a second person personal pronoun”, would be interpreted as “cmavo be zo do”, and have the place structure:

### Example 7.15.2

$c_1$  is a second person pronoun in language  $c_4$

since both the  $c_2$  place (the grammatical class) and the  $c_3$  place (the meaning) are obvious from the context “do”.

An anticipated use of rafsi for cmavo in the “fo'a” series is to express terjvo which can't be expressed in a convenient rafsi form, because they are too long to express, or are formally inconvenient (fu'ivla, cmene, and so forth.) An example would be:

### Example 7.15.3

fo'a goi le kulnrsu,omi .i lo fo'arselsanga  
 $x_6$  stands for Finnish-culture. An  $x_6$ -song

Finally, lujvo involving “zi'o” are also possible, and are fully discussed in Chapter 12. In brief, the convention is to use the rafsi for “zi'o” as a prefix immediately followed by the rafsi for the number of the place to be deleted. Thus, if we consider a beverage (something drunk without considering who, if anyone, drinks it) as a “se pinxe be zi'o”, the lujvo corresponding to this is “zilrelselpinxe” (deleting the second place of “se pinxe”). Deleting the  $x_1$  place in this fashion would move all remaining places up by one. This would mean that “zilpavypinxe” has the same place structure as “zilrelselpinxe”, and “lo zilpavypinxe”, like “lo zilrelselpinxe”, refers to a beverage, and not to a non-existent drinker.

The pro-brididi “co'e”, “du”, and “bu'a” also have rafsi, which can be used just as if they were gismu. The resulting lujvo have (except for “du”-based lujvo) highly context-dependent meanings.

## 7.16 **cmavo Index**

### 7.16.1 **KOhA cmavo by series**

#### **mi-series**

**Definition 7.14**

<i>mi</i>	I	mib
<i>do</i>	you	don, doi
<i>mi'o</i>	you and I	
<i>mi'a</i>	I and others, we but not you	
<i>ma'a</i>	you and I and others	
<i>do'o</i>	you and others	
<i>ko</i>	you-imperative	

**ti-series****Definition 7.15**

<i>ti</i>	this here; something nearby	tif
<i>ta</i>	that there; something distant	taz
<i>tu</i>	that yonder; something far distant	tuf

**di'u-series****Definition 7.16**

<i>di'u</i>	the previous utterance
<i>de'u</i>	an earlier utterance
<i>da'u</i>	a much earlier utterance
<i>di'e</i>	the next utterance
<i>de'e</i>	a later utterance
<i>da'e</i>	a much later utterance
<i>dei</i>	this very utterance
<i>do'i</i>	some utterance

**ko'a-series****Definition 7.17**

<i>ko'a</i>	<i>it</i> <sub>1</sub> ; 1 <sup>st</sup> assignable pro-sumti	
<i>ko'e</i>	<i>it</i> <sub>2</sub> ; 2 <sup>nd</sup> assignable pro-sumti	
<i>ko'i</i>	<i>it</i> <sub>3</sub> ; 3 <sup>rd</sup> assignable pro-sumti	
<i>ko'o</i>	<i>it</i> <sub>4</sub> ; 4 <sup>th</sup> assignable pro-sumti	
<i>ko'u</i>	<i>it</i> <sub>5</sub> ; 5 <sup>th</sup> assignable pro-sumti	
<i>fo'a</i>	<i>it</i> <sub>6</sub> ; 6 <sup>th</sup> assignable pro-sumti	fo'a
<i>fo'e</i>	<i>it</i> <sub>7</sub> ; 7 <sup>th</sup> assignable pro-sumti	fo'e
<i>fo'i</i>	<i>it</i> <sub>8</sub> ; 8 <sup>th</sup> assignable pro-sumti	fo'i
<i>fo'o</i>	<i>it</i> <sub>9</sub> ; 9 <sup>th</sup> assignable pro-sumti	
<i>fo'u</i>	<i>it</i> <sub>10</sub> ; 10 <sup>th</sup> assignable pro-sumti	

**ri-series****Definition 7.18**

<i>ri</i>	(repeats the last sumti)
<i>ra</i>	(repeats a previous sumti)
<i>ru</i>	(repeats a long-ago sumti)



**zo'e-series****Definition 7.19**

<i>zo'e</i>	the obvious value	
<i>zu'i</i>	the typical value	
<i>zi'o</i>	the nonexistent value	zil

**vo'a-series****Definition 7.20**

<i>vo'a</i>	$x_1$ of this bridi
<i>vo'e</i>	$x_2$ of this bridi
<i>vo'i</i>	$x_3$ of this bridi
<i>vo'o</i>	$x_4$ of this bridi
<i>vo'u</i>	$x_5$ of this bridi

**da-series****Definition 7.21**

<i>da</i>	<i>something</i> <sub>1</sub>	dav, dza
<i>de</i>	<i>something</i> <sub>2</sub>	
<i>di</i>	<i>something</i> <sub>3</sub>	

**Others****Definition 7.22**

<i>ke'a</i>	relativized sumti
<i>ma</i>	sumti question
<i>ce'u</i>	abstraction focus

**7.16.2 GOhA and other pro-bridi by series****broda-series (not GOhA)****Definition 7.23**

<i>broda</i>	$i_{s_1}$ ; 1 <sup>st</sup> assignable pro-bridi
<i>brode</i>	$i_{s_2}$ ; 2 <sup>nd</sup> assignable pro-bridi
<i>brodi</i>	$i_{s_3}$ ; 3 <sup>rd</sup> assignable pro-bridi
<i>brodo</i>	$i_{s_4}$ ; 4 <sup>th</sup> assignable pro-bridi
<i>brodu</i>	$i_{s_5}$ ; 5 <sup>th</sup> assignable pro-bridi

**go'i-series****Definition 7.24**

<i>go'i</i>	(repeats the last bridi)
<i>go'a</i>	(repeats a previous bridi)
<i>go'u</i>	(repeats a long-ago bridi)

<i>go'e</i>	(repeats the last-but-one bridi)
<i>go'o</i>	(repeats a future bridi)
<i>nei</i>	(repeats the current bridi)
<i>no'a</i>	(repeats the next outer bridi)

**bu'a-series****Definition 7.25**

<i>bu'a</i>	<i>predicate</i> <sub>1</sub>	bu
<i>bu'e</i>	<i>predicate</i> <sub>2</sub>	
<i>bu'i</i>	<i>predicate</i> <sub>3</sub>	

**Others****Definition 7.26**

<i>co'e</i>	has the obvious relationship	com, co'e
<i>mo</i>	bridi question	
<i>du</i>	identity: $x_1$ is identical to $x_2, x_3, \dots$	dub, du'o

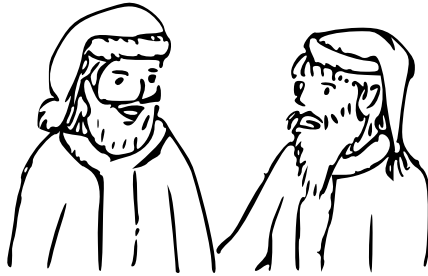
**7.16.3 Other cmavo discussed in this chapter****Definition 7.27**

<i>goi</i>	pro-sumti assignment	<i>GOI</i> , ko'a-series
<i>cei</i>	pro-bridi assignment	<i>CEI</i> , broda-series
<i>ra'o</i>	pro-sumti/pro-bridi update	<i>RAhO</i>
<i>soi</i>	reciprocity	<i>SOI</i>
<i>se'u</i>	soi terminator	<i>SEhU</i>
<i>da'o</i>	cancel all pro-sumti/pro-bridi	<i>DAhO</i>

## Chapter

## 8

# Relative Clauses, Which Make sumti Even More Complicated



*ko viska re prenu  
poi bruna la santas.*

### 8.1 What are you pointing at?

The following cmavo are discussed in this section:

#### Definition 8.1

<i>poi</i>	restrictive clause introducer	<i>NOI</i>
<i>ke'a</i>	relative pro-sumti	<i>GOhA</i>
<i>ku'o</i>	relative clause terminator	<i>KUhO</i>

Let us think about the problem of communicating what it is that we are pointing at when we are pointing at something. In Lojban, we can refer to what we are pointing at by using the pro-sumti “ti” if it is nearby, or “ta” if it is somewhat further away, or “tu” if it is distant. (Pro-sumti are explained in full in Chapter 7.)

However, even with the assistance of a pointing finger, or pointing lips, or whatever may be appropriate in the local culture, it is often hard for a listener to tell just what is being pointed at. Suppose one is pointing at a person (in particular, in the direction of his or her face), and says:

**Example 8.1.1**

ti cu barda  
This-one is-big.

What is the referent of “ti”? Is it the person? Or perhaps it is the person’s nose? Or even (for “ti” can be plural as well as singular, and mean “these ones” as well as “this one”) the pores on the person’s nose?

To help solve this problem, Lojban uses a construction called a *relative clause*. Relative clauses are usually attached to the end of sumti, but there are other places where they can go as well, as explained later in this chapter. A relative clause begins with a word of selma’o NOI, and ends with the elidable terminator “ku’o” (of selma’o KUhO). As you might suppose, “noi” is a cmavo of selma’o NOI; however, first we will discuss the cmavo “poi”, which also belongs to selma’o NOI.

In between the “poi” and the “ku’o” appears a full bridi, with the same syntax as any other bridi. Anywhere within the bridi of a relative clause, the pro-sumti “ke’a” (of selma’o KOhA) may be used, and it stands for the sumti to which the relative clause is attached (called the *relativized sumti*). Here are some examples before we go any further:

**Example 8.1.2**

ti poi ke’a prenu ku’o cu barda  
This-thing such-that(*it* is-a-person) is-large.  
This thing which is a person is big.  
This person is big.

**Example 8.1.3**

ti poi ke’a nazbi ku’o cu barda  
This-thing such-that(*it* is-a-nose) is-large.  
This thing which is a nose is big.  
This nose is big.

**Example 8.1.4**

ti poi ke’a nazbi kapkevna ku’o cu barda  
This-thing such-that(*it* is-a-nose-type-of skin-hole) is-big.  
These things which are nose-pores are big.  
These nose-pores are big.

In the literal translations throughout this chapter, the word *it*, italicized, is used to represent the cmavo “ke’a”. In each case, it serves to represent the sumti (in Example 8.1.2 through Example 8.1.4, the cmavo “ti”) to which the relative clause is attached.

Of course, there is no reason why “ke’a” needs to appear in the  $x_1$  place of a relative clause bridi; it can appear in any place, or indeed even in a sub-bridi within the relative clause bridi. Here are two more examples:

**Example 8.1.5**

tu poi le mlatu pu lacpu ke’a ku’o cu ratcu  
That-distant-thing such-that(the cat *<past>* drags *it*) is-a-rat.  
That thing which the cat dragged is a rat.  
What the cat dragged is a rat.

**Example 8.1.6**

ta poi mi djica le nu mi ponse ke'a (*kei*) ku'o cu bloti  
 That-thing such-that(I desire the event-of(I own *it*)) is-a-boat.  
 That thing that I want to own is a boat.

In Example 8.1.6, “ke'a” appears in an abstraction clause (abstractions are explained in Chapter 11) within a relative clause.

Like any sumti, “ke'a” can be omitted. The usual presumption in that case is that it then falls into the  $x_1$  place:

**Example 8.1.7**

ti poi nazbi cu barda  
 This-thing which is-a-nose is-big.

almost certainly means the same thing as Example 8.1.3. However, “ke'a” can be omitted if it is clear to the listener that it belongs in some place other than  $x_1$ :

**Example 8.1.8**

tu poi le mlatu pu lacpu cu ratcu  
 That-distant-thing which the cat drags is-a-rat

is equivalent to Example 8.1.4.

As stated before, “ku'o” is an elidable terminator, and in fact it is almost always elidable. Throughout the rest of this chapter, “ku'o” will not be written in any of the examples unless it is absolutely required: thus, Example 8.1.2 can be written:

**Example 8.1.9**

ti poi prenu cu barda  
 That which is-a-person is-big.  
 That person is big.

without any change in meaning. Note that “poi” is translated “which” rather than “such-that” when “ke'a” has been omitted from the  $x_1$  place of the relative clause *bridi*. The word “which” is used in English to introduce English relative clauses: other words that can be used are “who” and “that”, as in:

**Example 8.1.10**

I saw a man who was going to the store.

and

**Example 8.1.11**

The building that the school was located in is large.

In Example 8.1.10 the relative clause is “who was going to the store”, and in Example 8.1.11 it is “that the school was located in”. Sometimes “who”, “which”, and “that” are used in literal translations in this chapter in order to make them read more smoothly.

## 8.2 Incidental relative clauses

The following cmavo are discussed in this section:

<b>Definition 8.2</b>		
<i>noi</i>	incidental relative clause introducer	<i>NOI</i>

There are two basic kinds of relative clauses: restrictive relative clauses introduced by “poi”, and incidental (sometimes called simply *non-restrictive*) relative clauses introduced by “noi”. The difference between restrictive and incidental relative clauses is that restrictive clauses provide information that is essential to identifying the referent of the sumti to which they are attached, whereas incidental relative clauses provide additional information which is helpful to the listener but is not essential for identifying the referent of the sumti. All of the examples in Section 8.1 are restrictive relative clauses: the information in the relative clause is essential to identification. (The title of this chapter, though, uses an incidental relative clause.)

Consider the following examples:

<b>Example 8.2.1</b>
le gerku poi blanu cu barda The dog which is-blue is-large. The dog which is blue is large.

<b>Example 8.2.2</b>
le gerku noi blanu cu barda The dog incidentally-which is-blue is-large. The dog, which is blue, is large.

In Example 8.2.1, the information conveyed by “poi blanu” is essential to identifying the dog in question: it restricts the possible referents from dogs in general to dogs that are blue. This is why “poi” relative clauses are called *restrictive*. In Example 8.2.2, on the other hand, the dog which is referred to has presumably already been identified clearly, and the relative clause “noi blanu” just provides additional information about it. (If in fact the dog hasn’t been identified clearly, then the relative clause does not help identify it further.)

In English, the distinction between restrictive and incidental relative clauses is expressed in writing by surrounding incidental, but not restrictive, clauses with commas. These commas are functioning as parentheses, because incidental relative clauses are essentially parenthetical. This distinction in punctuation is represented in speech by a difference in tone of voice. In addition, English restrictive relative clauses can be introduced by “that” as well as “which” and “who”, whereas incidental relative clauses cannot begin with “that”. Lojban, however, always uses the cmavo “poi” and “noi” rather than punctuation or intonation to make the distinction.

Here are more examples of incidental relative clauses:

<b>Example 8.2.3</b>
mi noi jdice cu zvati I who-incidentally am-a-judge am-at <i>(some-place)</i> . I, a judge, am present.

In this example, “mi” is already sufficiently restricted, and the additional information that I am a judge is being provided solely for the listener’s edification.

**Example 8.2.4**

xu do viska le mi karce noi blabi  
 ⟨*True?*⟩ You see my car incidentally-which is-white.  
 Do you see my car, which is white?

In Example 8.2.4, the speaker is presumed to have only one car, and is providing incidental information that it is white. (Alternatively, he or she might have more than one car, since “le karce” can be plural, in which case the incidental information is that each of them is white.) Contrast Example 8.2.5 with a restrictive relative clause:

**Example 8.2.5**

xu do viska le mi karce poi blabi  
 ⟨*True?*⟩ You see my car which is-white.  
 Do you see my car that is white?  
 Do you see my white car?

Here the speaker probably has several cars, and is restricting the referent of the sumti “le mi karce” (and thereby the listener’s attention) to the white one only. Example 8.2.5 means much the same as Example 8.2.6, which does not use a relative clause:

**Example 8.2.6**

xu do viska le mi blabi karce  
 ⟨*True?*⟩ You see my white car.  
 Do you see my car, the white one?

So a restrictive relative clause attached to a description can often mean the same as a description involving a tanru. However, “blabi karce”, like all tanru, is somewhat vague: in principle, it might refer to a car which carries white things, or even express some more complicated concept involving whiteness and car-ness; the restrictive relative clause of Example 8.2.5 can only refer to a car which is white, not to any more complex or extended concept.

### 8.3 Relative phrases

The following cmavo are discussed in this section:

**Definition 8.3**

<i>pe</i>	restrictive association	<i>GOI</i>
<i>po</i>	restrictive possession	<i>GOI</i>
<i>po'e</i>	restrictive intrinsic possession	<i>GOI</i>
<i>po'u</i>	restrictive identification	<i>GOI</i>
<i>ne</i>	incidental association	<i>GOI</i>
<i>no'u</i>	incidental identification	<i>GOI</i>
<i>ge'u</i>	relative phrase terminator	<i>GEhU</i>

There are types of relative clauses (those which have a certain selbri) which are frequently wanted in Lojban, and can be expressed using a shortcut called a *relative phrase*. Relative phrases are introduced by cmavo of selma'o GOI, and consist of a GOI cmavo followed by a single sumti.

Here is an example of “pe”, plus an equivalent sentence using a relative clause:

**Example 8.3.1**

le stizu pe mi cu blanu  
 The chair associated-with me is-blue.  
 My chair is blue.

**Example 8.3.2**

le stizu poi ke'a srana mi cu blanu  
 The chair such-that(*it* is-associated-with me) is-blue.

In Example 8.3.1 and Example 8.3.2, the link between the chair and the speaker is of the loosest kind.

Here is an example of “po”:

**Example 8.3.3**

le stizu po mi cu xunre  
 The chair specific-to me is red.

**Example 8.3.4**

le stizu poi ke'a se steci srana mi cu xunre  
 The chair such-that (*it* is-specifically associated-with me) is-red.

Example 8.3.3 and Example 8.3.4 contrast with Example 8.3.1 and Example 8.3.2: the chair is more permanently connected with the speaker. A plausible (though not the only possible) contrast between Example 8.3.1 and Example 8.3.3 is that “pe mi” would be appropriate for a chair the speaker is currently sitting on (whether or not the speaker owned that chair), and “po mi” for a chair owned by the speaker (whether or not he or she was currently occupying it).

As a result, the relationship expressed between two sumti by “po” is usually called *possession*, although it does not necessarily imply ownership, legal or otherwise. The central concept is that of specificity (“steci” in Lojban).

Here is an example of “po’e”, as well as another example of “po”:

**Example 8.3.5**

le birka po'e mi cu spofu  
 The arm intrinsically-possessed-by me is-broken

**Example 8.3.6**

le birka poi jinzi ke se steci srana mi cu spofu  
 The arm which is-intrinsically (specifically associated-with) me is-broken

**Example 8.3.7**

le botpi po mi cu spofu  
 The bottle specific-to me is-broken

Example 8.3.5 and Example 8.3.6 on the one hand, and Example 8.3.7 on the other, illustrate the contrast between two types of possession called *intrinsic* and *extrinsic*, or sometimes *inalienable* and *alienable*, respectively. Something is intrinsically (or inalienably) possessed by



someone if the possession is part of the possessor, and cannot be changed without changing the possessor. In the case of Example 8.3.5, people are usually taken to intrinsically possess their arms: even if an arm is cut off, it remains the arm of that person. (If the arm is transplanted to another person, however, it becomes intrinsically possessed by the new user, though, so intrinsic possession is a matter of degree.)

By contrast, the bottle of Example 8.3.7 can be given away, or thrown away, or lost, or stolen, so it is possessed extrinsically (alienably). The exact line between intrinsic and extrinsic possession is culturally dependent. The U.S. Declaration of Independence speaks of the “inalienable rights” of men, but just what those rights are, and even whether the concept makes sense at all, varies from culture to culture.

Note that Example 8.3.5 can also be expressed without a relative clause:

**Example 8.3.8**

le birka be mi cu spofu  
The arm of-body me is broken

reflecting the fact that the gismu “birka” has an  $x_2$  place representing the body to which the arm belongs. Many, but not all, cases of intrinsic possession can be thus covered without using “po’e” by placing the possessor into the appropriate place of the description selbri.

Here is an example of “po’u”:

**Example 8.3.9**

le gerku po’u le mi pendo cu cinba mi  
The dog which-is my friend kisses me.

**Example 8.3.10**

le gerku poi du le mi pendo cu cinba mi  
The dog which = my friend kisses me.

The cmavo “po’u” does not represent possession at all, but rather identity. (Note that it means “poi du” and its form was chosen to suggest the relationship.)

In Example 8.3.9, the use of “po’u” tells us that “le gerku” and “le mi pendo” represent the same thing. Consider the contrast between Example 8.3.9 and:

**Example 8.3.11**

le mi pendo po’u le gerku cu cinba mi  
My friend which-is the dog kisses me.

The facts of the case are the same, but the listener’s knowledge about the situation may not be. In Example 8.3.9, the listener is presumed not to understand which dog is meant by “le gerku”, so the speaker adds a relative phrase clarifying that it is the particular dog which is the speaker’s friend.

Example 8.3.11, however, assumes that the listener does not know which of the speaker’s friends is referred to, and specifies that it is the friend that is the dog (which dog is taken to be obvious). Here is another example of the same contrast:

**Example 8.3.12**

le tcadu po’u la nu,iork  
The city of New York (<not another city>).

**Example 8.3.13**

la nu,iork po'u le tcadu  
New York the city (not the state or some other New York)

The principle that the possessor and the possessed may change places applies to all the GOI cmavo, and allows for the possibility of odd effects:

**Example 8.3.14**

le kabri pe le mi pendo cu cmalu  
The cup associated-with my friend is small.  
My friend's cup is small

**Example 8.3.15**

le mi pendo pe le kabri cu cmalu  
My friend associated-with the cup is small.  
My friend, the one with the cup, is small.

Example 8.3.14 is useful in a context which is about my friend, and states that his or her cup is small, whereas Example 8.3.15 is useful in a context that is primarily about a certain cup, and makes a claim about “my friend of the cup”, as opposed to some other friend of mine. Here the cup appears to “possess” the person! English can't even express this relationship with a possessive — “the cup's friend of mine” looks like nonsense — but Lojban has no trouble doing so.

Finally, the cmavo “ne” and “no'u” stand to “pe” and “po'u”, respectively, as “noi” does to “poi” — they provide incidental information:

**Example 8.3.16**

le blabi gerku ne mi cu batci do  
The white dog, incidentally-associated-with me, bites you.  
The white dog, which is mine, bites you.

In Example 8.3.16, the white dog is already fully identified (after all, presumably the listener know which dog bit him or her!). The fact that it is yours is merely incidental to the main brid claim.

Distinguishing between “po'u” and “no'u” can be a little tricky. Consider a room with several men in it, one of whom is named Jim. If you don't know their names, I might say:

**Example 8.3.17**

le nanmu no'u la djim. cu terpemci  
The man, incidentally-who-is Jim, is-a-poet.  
The man, Jim, is a poet.

Here I am saying that one of the men is a poet, and incidentally telling you that he is Jim. But if you do know the names, then

**Example 8.3.18**

le nanmu po'u la djim. cu terpemci  
The man who-is Jim is-a-poet.  
The man, the one named Jim, is a poet.

is appropriate. Now I am using the fact that the man I am speaking of is Jim in order to pick out which man I mean.

It is worth mentioning that English sometimes over-specifies possession from the Lojban point of view (and the point of view of many other languages, including ones closely related to English). The idiomatic English sentence

**Example 8.3.19**

The man put his hands in his pockets.

seems strange to a French-or-German-speaking person: whose pockets would he put his hands into? and even odder, whose hands would he put into his pockets? In Lojban, the sentence

**Example 8.3.20**

le nanmu cu punji le xanci le daski  
The man puts the hand at-locus-the pocket.

is very natural. Of course, if the man is in fact putting his hands into another's pockets, or another's hands into his pockets, the fact can be specified.

Finally, the elidable terminator for GOI cmavo is "ge'u" of selma'o GEhU; it is almost never required. However, if a logical connective immediately follows a sumti modified by a relative phrase, then an explicit "ge'u" is needed to allow the connective to affect the relativized sumti rather than the sumti of the relative phrase. (What about the cmavo after which selma'o GOI is named? It is discussed in Chapter 7, as it is not semantically akin to the other kinds of relative phrases, although the syntax is the same.)

## 8.4 Multiple relative clauses: "zi'e"

**Definition 8.4**

*zi'e* relative clause joiner

*ZIhE*

Sometimes it is necessary or useful to attach more than one relative clause to a sumti. This is made possible in Lojban by the cmavo "zi'e" (of selma'o ZIhE), which is used to join one or more relative clauses together into a single unit, thus making them apply to the same sumti. For example:

**Example 8.4.1**

le gerku poi blabi zi'e poi batci le nanmu cu klama  
The dog which is white and which bites the man goes.

The most usual translation of "zi'e" in English is "and", but "zi'e" is not really a logical connective: unlike most of the true logical connectives (which are explained in Chapter 14), it cannot be converted into a logical connection between sentences.

It is perfectly correct to use "zi'e" to connect relative clauses of different kinds:

**Example 8.4.2**

le gerku poi blabi zi'e noi le mi pendo cu ponse ke'a cu klama  
The dog that-is(white) and incidentally-such-that(my friend owns *it*) goes.  
The dog that is white, which my friend owns, is going.

In Example 8.4.2, the restrictive clause “poi blabi” specifies which dog is referred to, but the incidental clause “noi le mi pendo cu ponce” is mere incidental information: the listener is supposed to already have identified the dog from the “poi blabi”. Of course, the meaning (though not necessarily the emphasis) is the same if the incidental clause appears first.

It is also possible to connect relative phrases with “zi’e”, or a relative phrase with a relative clause:

**Example 8.4.3**

le botpi po mi zi’e poi blanu cu spofu  
 The bottle specific-to me and which-is blue is-broken.  
 My blue bottle is broken.

Note that if the colloquial translation of Example 8.4.3 were “My bottle, which is blue, is broken”, then “noi” rather than “poi” would have been correct in the Lojban version, since that version of the English implies that you do not need to know the bottle is blue. As written, Example 8.4.3 suggests that I probably have more than one bottle, and the one in question needs to be picked out as the blue one.

**Example 8.4.4**

mi ba zutse le stizu pe mi zi’e po do zi’e poi xunre  
 I *<future>* sit-in the chair associated-with me and specific-to you and which-is red.  
 I will sit in my chair (really yours), the red one.

Example 8.4.4 illustrates that more than two relative phrases or clauses can be connected with “zi’e”. It almost defies colloquial translation because of the very un-English contrast between “pe mi”, implying that the chair is temporarily connected with me, and “po do”, implying that the chair has a more permanent association with you. (Perhaps I am a guest in your house, in which case the chair would naturally be your property.) Here is another example, mixing a relative phrase and two relative clauses, a restrictive one and a non-restrictive one:

**Example 8.4.5**

mi ba citka le dembi pe mi zi’e poi cpana le mi palta zi’e noi do dunda ke’a mi  
 I *<future>* eat the beans associated-with me and which are-upon my plate and which-  
 incidentally you gave *it* to-me.  
 I’ll eat my beans that are on my plate, the ones you gave me.

## 8.5 Non-veridical relative clauses: “voi”

**Definition 8.5**

*voi* non-veridical relative clause introducer

*NOI*

There is another member of selma’o NOI which serves to introduce a third kind of relative clause: “voi”. Relative clauses introduced by “voi” are restrictive, like those introduced by “poi”. However, there is a fundamental difference between “poi” and “voi” relative clauses. A “poi” relative clause is said to be veridical, in the same sense that a description using “lo” or “loi” is: it is essential to the interpretation that the bridi actually be true. For example:

**Example 8.5.1**

le gerku poi blabi cu klama  
The dog which is-white goes.

it must actually be true that the dog is white, or the sentence constitutes a miscommunication. If there is a white dog and a brown dog, and the speaker uses “le gerku poi blabi” to refer to the brown dog, then the listener will not understand correctly. However,

**Example 8.5.2**

le gerku voi blabi cu klama  
the dog which-I-describe-as white goes

puts the listener on notice that the dog in question may not actually meet objective standards (whatever they are) for being white: only the speaker can say exactly what is meant by the term. In this way, “voi” is like “le”; the speaker’s intention determines the meaning.

As a result, the following two sentences:

**Example 8.5.3**

le nanmu cu ninmu  
That-which-I-describe-as a-man is-a-woman.  
The “guy” is actually a gal.

**Example 8.5.4**

ti voi nanmu cu ninmu  
This-thing which-I-describe-as a-man is-a-woman.

mean essentially the same thing (except that Example 8.5.5 involves pointing thanks to the use of “ti”, whereas Example 8.5.4 doesn’t), and neither one is self-contradictory: it is perfectly all right to describe something as a man (although perhaps confusing to the listener) even if it actually is a woman.

## 8.6 Relative clauses and descriptors

So far, this chapter has described the various kinds of relative clauses (including relative phrases). The list is now complete, and the rest of the chapter will be concerned with the syntax of sumti that include relative clauses. So far, all relative clauses have appeared directly after the sumti to which they are attached. This is the most common position (and originally the only one), but a variety of other placements are also possible which produce a variety of semantic effects.

There are actually three places where a relative clause can be attached to a description sumti: after the descriptor (“le”, “lo”, or whatever), after the embedded selbri but before the elidable terminator (which is “ku”), and after the “ku”. The relative clauses attached to descriptors that we have seen have occupied the second position. Thus Example 8.5.1, if written out with all elidable terminators, would appear as:

**Example 8.6.1**

le gerku poi blabi ku’o ku cu klama vau  
the(dog which(is-white)) goes.  
The dog which is white is going.

Here “ku’o” is the terminator paired with “poi” and “ku” with “le”, and “vau” is the terminator of the whole bridi.

When a simple descriptor using “le”, like “le gerku”, has a relative clause attached, it is purely a matter of style and emphasis where the relative clause should go. Therefore, the following examples are all equivalent in meaning to Example 8.6.1:

**Example 8.6.2**

le poi blabi ku’o gerku cu klama  
The such-that (it-is-white) dog goes.

**Example 8.6.3**

le gerku ku poi blabi cu klama  
The(dog) which is-white goes.

Example 8.6.1 will seem most natural to speakers of languages like English, which always puts relative clauses after the noun phrases they are attached to; Example 8.6.2, on the other hand, may seem more natural to Finnish or Chinese speakers, who put the relative clause first. Note that in Example 8.6.2, the elidable terminator “ku’o” must appear, or the selbri of the relative clause (“blabi”) will merge with the selbri of the description (“gerku”), resulting in an ungrammatical sentence. The purpose of the form appearing in Example 8.6.3 will be apparent shortly.

As is explained in detail in Chapter 6, two different numbers (known as the “inner quantifier” and the “outer quantifier”) can be attached to a description. The inner quantifier specifies how many things the descriptor refers to: it appears between the descriptor and the description selbri. The outer quantifier appears before the descriptor, and specifies how many of the things referred to by the descriptor are involved in this particular bridi. In the following example,

**Example 8.6.4**

re le mu prenu cu klama le zarci  
Two-of the five persons go to-the market.  
Two of the five people *<that I have in mind>* are going to the market.

“mu” is the inner quantifier and “re” is the outer quantifier. Now what is meant by attaching a relative clause to the sumti “re le mu prenu”? Suppose the relative clause is “poi ninmu” (meaning “who are women”). Now the three possible attachment points discussed previously take on significance.

**Example 8.6.5**

re le poi ninmu ku’o mu prenu cu klama le zarci  
Two of the such-that(*they*) are-women) five persons go to-the market.  
Two women out of the five persons go to the market.

**Example 8.6.6**

re le mu prenu poi ninmu *<ku>* cu klama le zarci  
Two of the (five persons which are-women) go to-the market.  
Two of the five women go to the market.

**Example 8.6.7**

re le mu prenu ku poi ninmu cu klama le zarci  
 (Two of the five persons) which are-women go to-the market.  
 Two women out of the five persons go to the market.

As the parentheses show, Example 8.6.6 means that all five of the persons are women, whereas Example 8.6.7 means that the two who are going to the market are women. How do we remember which is which? If the relative clause comes after the explicit “ku”, as in Example 8.6.7, then the sumti as a whole is qualified by the relative clause. If there is no “ku”, or if the relative clause comes before an explicit “ku”, then the relative clause is understood to apply to everything which the underlying selbri applies to.

What about Example 8.6.5? By convention, it means the same as Example 8.6.7, and it requires no “ku”, but it does typically require a “ku’o” instead. Note that the relative clause comes before the inner quantifier.

When “le” is the descriptor being used, and the sumti has no explicit outer quantifier, then the outer quantifier is understood to be “ro” (meaning “all”), as is explained in Chapter 6. Thus “le gerku” is taken to mean “all of the things I refer to as dogs”, possibly all one of them. In that case, there is no difference between a relative clause after the “ku” or before it. However, if the descriptor is “lo”, the difference is quite important:

**Example 8.6.8**

lo prenu ku noi blabi cu klama le zarci  
 (Some persons) incidentally-which are-white go to-the market.  
 Some people, who are white, go to the market.

**Example 8.6.9**

lo prenu noi blabi *<ku>* cu klama le zarci  
 Some (persons incidentally-which are-white) go to-the market.  
 Some of the people, who by the way are white, go to the market.

Both Example 8.6.8 and Example 8.6.9 tell us that one or more persons are going to the market. However, they make very different incidental claims. Now, what does “lo prenu noi blabi” mean? Well, the default inner quantifier is “ro” (meaning “all”), and the default outer quantifier is “su’o” (meaning “at least one”). Therefore, we must first take all persons, then choose at least one of them. That one or more people will be going.

In Example 8.6.8, the relative clause described the sumti once the outer quantifier was applied: one or more people, who are white, are going. But in Example 8.6.9, the relative clause actually describes the sumti before the outer quantification is applied, so that it ends up meaning “First take all persons — by the way, they’re all white”. But not all people are white, so the incidental claim being made here is false.

The safe strategy, therefore, is to always use “ku” when attaching a “noi” relative clause to a “lo” descriptor. Otherwise we may end up claiming far too much.

When the descriptor is “la”, indicating that what follows is a selbri used for naming, then the positioning of relative clauses has a different significance. A relative clause inside the “ku”, whether before or after the selbri, is reckoned part of the name; a relative clause outside the “ku” is not. Therefore,

**Example 8.6.10**

mi viska la nanmu poi terpa le ke'a xirma <ku>  
 I see that-named("man which fears the of-*it* horse").  
 I see Man Afraid Of His Horse.

says that the speaker sees a person with a particular name, who does not necessarily fear any horses, whereas

**Example 8.6.11**

mi viska la nanmu ku poi terpa le ke'a xirma.  
 I see that-named("Man") which fears the of-*it* horse.  
 I see the person named "Man" who is afraid of his horse.

refers to one (or more) of those named "Man", namely the one(s) who are afraid of their horses.

Finally, so-called *indefinite sumti* like "re karce", which means almost the same as "re lo karce" (which in turn means the same as "re lo ro karce"), can have relative clauses attached; these are taken to be of the outside-the-"ku" variety. Here is an example:

**Example 8.6.12**

mi ponse re karce <ku> poi xekri  
 I possess two cars which-are black.

The restrictive relative clause only affects the two cars being affected by the main bridi, not all cars that exist. It is ungrammatical to try to place a relative clause within an indefinite sumti (that is, before an explicitly expressed terminating "ku".) Use an explicit "lo" instead.

## 8.7 Possessive sumti

In Example 8.2.4 through Example 8.2.6, the sumti "le mi karce" appears, glossed as "my car". Although it might not seem so, this sumti actually contains a relative phrase. When a sumti appears between a descriptor and its description selbri, it is actually a "pe" relative phrase. So

**Example 8.7.1**

le mi karce cu xunre  
 my car is-red.

and

**Example 8.7.2**

le pe mi karce cu xunre  
 the (associated-with me) car is-red.

mean exactly the same thing. Furthermore, since there are no special considerations of quantifiers here,

**Example 8.7.3**

le karce pe mi cu xunre  
 The car associated-with me is-red



means the same thing as well. A sumti like the one in Example 8.7.1 is called a *possessive sumti*. Of course, it does not really indicate possession in the sense of ownership, but like “pe” relative phrases, indicates only weak association; you can say “le mi karce” even if you’ve only borrowed it for the night. (In English, “my car” usually means “le karce po mi”, but we do not have the same sense of possession in “my seat on the bus”; Lojban simply makes the weaker sense the standard one.) The inner sumti, “mi” in Example 8.7.1, is correspondingly called the *possessor sumti*.

Historically, possessive sumti existed before any other kind of relative phrase or clause, and were retained when the machinery of relative phrases and clauses as detailed in this chapter so far was slowly built up. When preposed relative clauses of the Example 8.7.2 type were devised, possessive sumti were most easily viewed as a special case of them.

Although any sumti, however complex, can appear in a full-fledged relative phrase, only simple sumti can appear as possessor sumti, without a “pe”. Roughly speaking, the legal possessor sumti are: pro-sumti, quotations, names and descriptions, and numbers. In addition, the possessor sumti may not be preceded by a quantifier, as such a form would be interpreted as the unusual “descriptor + quantifier + sumti” type of description. All these sumti forms are explained in full in Chapter 6.

Here is an example of a description used in a possessive sumti:

**Example 8.7.4**

le le nanmu ku karce cu blanu  
The (associated-with-the man) car is blue.  
The man’s car is blue.

Note the explicit “ku” at the end of the possessor sumti, which prevents the selbri of the possessor sumti from merging with the selbri of the main description sumti. Because of the need for this “ku”, the most common kind of possessor sumti are pro-sumti, especially personal pro-sumti, which require no elidable terminator. Descriptions are more likely to be attached with relative phrases.

And here is a number used as a possessor sumti:

**Example 8.7.5**

le li mu jdice se bende  
The of-the-number-five judging team-member  
Juror number 5

which is not quite the same as “the fifth juror”; it simply indicates a weak association between the particular juror and the number 5.

A possessive sumti may also have regular relative clauses attached to it. This would need no comment if it were not for the following special rule: a relative clause immediately following the possessor sumti is understood to affect the possessor sumti, not the possessive. For example:

**Example 8.7.6**

le mi noi sipna vau karce cu na klama  
The of-me incidentally-which(is-sleeping) car isn’t going.

means that my car isn’t going; the incidental claim of “noi sipna” applies to me, not my car, however. If I wanted to say that the car is sleeping (whatever that might mean) I would need:

**Example 8.7.7**

le mi karce poi sipna cu na klama  
The of-me car which sleeps isn't going.

Note that Example 8.7.6 uses “vau” rather than “ku'o” at the end of the relative clause: this terminator ends every simple bridi and is almost always elidable; in this case, though, it is a syllable shorter than the equally valid alternative, “ku'o”.

## 8.8 Relative clauses and complex sumti: “vu'o”

**Definition 8.6**

*vu'o* relative clause attacher

*VUho*

Normally, relative clauses attach only to simple sumti or parts of sumti: pro-sumti, names and descriptions, pure numbers, and quotations. An example of a relative clause attached to a pure number is:

**Example 8.8.1**

li pai noi na'e frinu namcu  
The-number pi, incidentally-which is-a-non-fraction number  
The irrational number pi

And here is an incidental relative clause attached to a quotation:

**Example 8.8.2**

lu mi klama le zarci li'u noi mi cusku ke'a cu jufra  
<quote> I go to-the market <unquote> incidentally-which(I express it) is-a-sentence.  
“I'm going to the market”, which I'd said, is a sentence.

which may serve to identify the author of the quotation or some other relevant, but subsidiary, fact about it. All such relative clauses appear only after the simple sumti, never before it.

In addition, sumti with attached sumti qualifiers of selma'o LAhE or NAhE+BO (which are explained in detail in Chapter 6) can have a relative clause appearing after the qualifier and before the qualified sumti, as in:

**Example 8.8.3**

la'e poi tolcitno vau lu le xunre cmaxirma li'u cu zvati le vu kumfa  
A-referent-of (which is-old) <quote> The Red Small-horse <unquote> is-at the <far distance>  
room.  
An old “The Red Pony” is in the far room.

Example 8.8.3 is a bit complex, and may need some picking apart. The quotation “lu le xunre cmaxirma li'u” means the string of words “The Red Pony”. If the “la'e” at the beginning of the sentence were omitted, Example 8.8.3 would claim that a certain string of words is in a room distant from the speaker. But obviously a string of words can't be in a room! The effect of the “la'e” is to modify the sumti so that it refers not to the words themselves, but to the referent of those words, a novel by John Steinbeck (presumably in Lojban translation). The particular

copy of “The Red Pony” is identified by the restrictive relative clause. Example 8.8.3 means exactly the same as:

**Example 8.8.4**

la'e lu le xunre cmaxirma li'u lu'u poi to'ercitno cu zvati le vu kumfa  
 A-referent-of (<quote> The Red Small-horse <unquote>) which is-old is-at the (<far distance> room).

and the two sentences can be considered stylistic variants. Note the required “lu'u” terminator, which prevents the relative clause from attaching to the quotation itself: we do not wish to refer to an old quotation!

Sometimes, however, it is important to make a relative clause apply to the whole of a more complex sumti, one which involves logical or non-logical connection (explained in Chapter 14). For example,

**Example 8.8.5**

la frank. .e la djordj. noi nanmu cu klama le zdani  
 Frank and George incidentally-who is-a-man go to-the house.  
 Frank and George, who is a man, go to the house.

The incidental claim in Example 8.8.5 is not that Frank and George are men, but only that George is a man, because the incidental relative clause attaches only to “la djordj”, the immediately preceding simple sumti.

To make a relative clause attach to both parts of the logically connected sumti in Example 8.8.5, a new cmavo is needed, “vu'o” (of selma'o VUHO). It is placed between the sumti and the relative clause, and extends the sphere of influence of that relative clause to the entire preceding sumti, including however many logical or non-logical connectives there may be.

**Example 8.8.6**

la frank. .e la djordj. vu'o noi nanmu cu klama le zdani  
 Frank and George incidentally-who are-men go to-the house.  
 Frank and George, who are men, go to the house.

The presence of “vu'o” here means that the relative clause “noi nanmu” extends to the entire logically connected sumti “la frank. .e la djordj.”; in other words, both Frank and George are claimed to be men, as the colloquial translation shows.

English is able to resolve the distinction correctly in the case of Example 8.8.5 and Example 8.8.6 by making use of number: “who is” rather than “who are”. Lojban doesn't distinguish between singular and plural verbs: “nanmu” can mean “is a man” or “are men”, so another means is required. Furthermore, Lojban's mechanism works correctly in general: if “nanmu” (meaning “is-a-man”) were replaced with “pu bajra” (“ran”), English would have to make the distinction some other way:

**Example 8.8.7**

la frank. .e la djordj. noi pu bajra cu klama le zdani  
 Frank and (George who <past> runs) go to-the house.  
 Frank and George, who ran, go to the house.

**Example 8.8.8**

la frank. .e la djordj. vu'o noi pu bajra cu klama le zdani  
 (Frank and George) who *<past>* runs go to-the house.  
 Frank and George, who ran, go to the house.

In spoken English, tone of voice would serve; in written English, one or both sentences would need rewriting.

## 8.9 Relative clauses in vocative phrases

Vocative phrases are explained in more detail in Chapter 6. Briefly, they are a method of indicating who a sentence or discourse is addressed to: of identifying the intended listener. They take three general forms, all beginning with *cmavo* from *selma'o* COI or DOI (called *vocative words*; there can be one or many), followed by either a name, a *selbri*, or a *sumti*. Here are three examples:

**Example 8.9.1**

coi. frank.  
 Hello, Frank.

**Example 8.9.2**

co'o xirma  
 Goodbye, horse.

**Example 8.9.3**

fi'i la frank. .e la djordj.  
 Welcome, Frank and George!

Note that Example 8.9.2 says farewell to something which doesn't really have to be a horse, something that the speaker simply thinks of as being a horse, or even might be something (a person, for example) who is named "Horse". In a sense, Example 8.9.2 is ambiguous between "co'o le xirma" and "co'o la xirma", a relatively safe semantic ambiguity, since names are ambiguous in general: saying "George" doesn't distinguish between the possible Georges.

Similarly, Example 8.9.1 can be thought of as an abbreviation of:

**Example 8.9.4**

coi la frank.  
 Hello, the-one-named "Frank".

Syntactically, vocative phrases are a kind of free modifier, and can appear in many places in Lojban text, generally at the beginning or end of some complete construct; or, as in Example 8.9.1 to Example 8.9.3, as sentences by themselves.

As can be seen, the form of vocative phrases is similar to that of *sumti*, and as you might expect, vocative phrases allow relative clauses in various places. In vocative phrases which are simple names (after the vocative words), any relative clauses must come just after the names:

**Example 8.9.5**

coi. frank. poi xunre se bende  
 Hello, Frank who is-a-red team-member  
 Hello, Frank from the Red Team!

The restrictive relative clause in Example 8.9.5 suggests that there is some other Frank (perhaps on the Green Team) from whom this Frank, the one the speaker is greeting, must be distinguished.

A vocative phrase containing a selbri can have relative clauses either before or after the selbri; both forms have the same meaning. Here are some examples:

**Example 8.9.6**

co'o poi mi zvati ke'a ku'o xirma  
 Goodbye, such-that(I am-at *it*) horse  
 Goodbye, horse where I am!

**Example 8.9.7**

co'o xirma poi mi zvati  
 Goodbye, horse such-that(I am-at-it).

Example 8.9.6 and Example 8.9.7 mean the same thing. In fact, relative clauses can appear in both places.

## 8.10 Relative clauses within relative clauses

For the most part, these are straightforward and uncomplicated: a sumti that is part of a relative clause bridri may itself be modified by a relative clause:

**Example 8.10.1**

le prenu poi zvati le kumfa poi blanu cu masno  
 The person who is-in the room which is-blue is-slow.

However, an ambiguity can exist if “ke’a” is used in a relative clause within a relative clause: does it refer to the outermost sumti, or to the sumti within the outer relative clause to which the inner relative clause is attached? The latter. To refer to the former, use a subscript on “ke’a”:

**Example 8.10.2**

le prenu poi zvati le kumfa poi ke'axire zbasu ke'a cu masno  
 The person who is-in the room which *it*<sub>2</sub> built *it* is-slow.  
 The person who is in the room which he built is slow.

Here, the meaning of *it*<sub>2</sub> is that sumti attached to the second relative clause, counting from the innermost, is used. Therefore, “ke'axipa” *it*<sub>1</sub> means the same as plain “ke'a”.

Alternatively, you can use a prenex (explained in full in Chapter 16), which is syntactically a series of sumti followed by the special cmavo “zo'u”, prefixed to the relative clause bridri:

**Example 8.10.3**

le prenu poi ke'a goi ko'a zo'u ko'a zvati le kumfa poi ke'a goi ko'e zo'u ko'a zbasu ke'a cu masno

The man who ( $it = it_1 : it_1$  is-in the room) which ( $it = it_2 : it_1$  built  $it_2$ ) is-slow.

Example 8.10.3 is more verbose than Example 8.10.2, but may be clearer, since it explicitly spells out the two “ke'a” cmavo, each on its own level, and assigns them to the assignable cmavo “ko'a” and “ko'e” (explained in Chapter 7).

## 8.11 Index of relative clause cmavo

### 8.11.1 Relative clause introducers

**Definition 8.7**

<i>noi</i>	incidental clauses	<i>NOI</i>
<i>poi</i>	restrictive clauses	<i>NOI</i>
<i>voi</i>	restrictive clauses (non-veridical)	<i>NOI</i>

### 8.11.2 Relative phrase introducers

**Definition 8.8**

<i>goi</i>	pro-sumti assignment	<i>GOI</i>
<i>pe</i>	restrictive association	<i>GOI</i>
<i>ne</i>	incidental association	<i>GOI</i>
<i>po</i>	extrinsic (alienable) possession	<i>GOI</i>
<i>po'e</i>	intrinsic (inalienable) possession	<i>GOI</i>
<i>po'u</i>	restrictive identification	<i>GOI</i>
<i>no'u</i>	incidental identification	<i>GOI</i>

### 8.11.3 Relativizing pro-sumti

**Definition 8.9**

<i>ke'a</i>	pro-sumti for relativized sumti	<i>KOhA</i>
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### 8.11.4 Relative clause joiner

**Definition 8.10**

<i>zi'e</i>	joins relative clauses applying to a single sumti	<i>ZIhE</i>
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### 8.11.5 Relative clause associator

**Definition 8.11**

<i>vu'o</i>	causes relative clauses to apply to all of a complex sumti
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### 8.11.6 Elidable terminators

**Definition 8.12**

<i>ku'o</i>	relative clause elidable terminator
<i>ge'u</i>	relative phrase elidable terminator

<i>KUhO</i>
<i>GEhU</i>





# To Boston via the Road Go I, with an Excursion into the Land of Modals



## 9.1 Introductory

The basic type of Lojban sentence is the *bridi*: a claim by the speaker that certain objects are related in a certain way. The objects are expressed by Lojban grammatical forms called *sumti*; the relationship is expressed by the Lojban grammatical form called a *selbri*.

The *sumti* are not randomly associated with the *selbri*, but according to a systematic pattern known as the “place structure” of the *selbri*. This chapter describes the various ways in which the place structure of Lojban *bridi* is expressed and by which it can be manipulated. The place structure of a *selbri* is a sequence of empty slots into which the *sumti* associated with that *selbri* are placed. The *sumti* are said to occupy the places of a *selbri*.

For our present purposes, every *selbri* is assumed to have a well-known place structure. If the *selbri* is a *brivla*, the place structure can be looked up in a dictionary (or, if the *brivla* is a *lujvo* not in any dictionary, inferred from the principles of *lujvo* construction as explained in

Chapter 12); if the selbri is a tanru, the place structure is the same as that of the final component in the tanru.

The stock example of a place structure is that of the gismu “klama”:

**Example 9.1.1**

$x_1$  comes/goes to destination  $x_2$  from origin  $x_3$  via route  $x_4$  employing means of transport  $x_5$ .

The “ $x_1 \dots x_5$ ” indicates that “klama” is a five-place predicate, and show the natural order (as assigned by the language engineers) of those places: agent, destination, origin, route, means.

The place structures of brivla are not absolutely stable aspects of the language. The work done so far has attempted to establish a basic place structure on which all users can, at first, agree. In the light of actual experience with the individual selbri of the language, there will inevitably be some degree of change to the brivla place structures.

## 9.2 Standard bridi form: “cu”

The following cmavo is discussed in this section:

**Definition 9.1**

*cu*            prefixed selbri separator

*CU*

The most usual way of constructing a bridi from a selbri such as “klama” and an appropriate number of sumti is to place the sumti intended for the  $x_1$  place before the selbri, and all the other sumti in order after the selbri, thus:

**Example 9.2.1**

mi cu klama la bastn. la .atlantas. le dargu le karce  
I go to-Boston from-Atlanta via-the road using-the car.

Here the sumti are assigned to the places as follows:

**Definition 9.2**

$x_1$	agent	mi
$x_2$	destinati	on la bastn.
$x_3$	origin	la .atlantas.
$x_4$	route	le dargu
$x_5$	means	le karce

(Note: Many of the examples in the rest of this chapter will turn out to have the same meaning as Example 9.2.1; this fact will not be reiterated.)

This ordering, with the  $x_1$  place before the selbri and all other places in natural order after the selbri, is called *standard bridi form*, and is found in the bulk of Lojban bridi, whether used in main sentences or in subordinate clauses. However, many other forms are possible, such as:

**Example 9.2.2**

mi la bastn. la .atlantas. le dargu le karce cu klama  
I, to-Boston from-Atlanta via-the road using-the car, go.

Here the selbri is at the end; all the sumti are placed before it. However, the same order is maintained. Similarly, we may split up the sumti, putting some before the selbri and others after it:

**Example 9.2.3**

mi la bastn. cu klama la .atlantas. le dargu le karce  
I to-Boston go from-Atlanta via-the road using-the car.

All of the variant forms in this section and following sections can be used to place emphasis on the part or parts which have been moved out of their standard places. Thus, Example 9.2.2 places emphasis on the selbri (because it is at the end); Example 9.2.3 emphasizes “la bastn.”, because it has been moved before the selbri. Moving more than one component may dilute this emphasis. It is permitted, but no stylistic significance has yet been established for drastic reordering. In all these examples, the cmavo “cu” (belonging to selma’o CU) is used to separate the selbri from any preceding sumti. It is never absolutely necessary to use “cu”. However, providing it helps the reader or listener to locate the selbri quickly, and may make it possible to place a complex sumti just before the selbri, allowing the speaker to omit elidable terminators, possibly a whole stream of them, that would otherwise be necessary.

The general rule, then, is that the selbri may occur anywhere in the bridi as long as the sumti maintain their order. The only exception (and it is an important one) is that if the selbri appears first, the  $x_1$  sumti is taken to have been omitted:

**Example 9.2.4**

klama la bastn. la .atlantas. le dargu le karce  
A-goer to-Boston from-Atlanta via-the road using-the car.  
Goes to-Boston from-Atlanta via-the road using-the car.  
Look: a goer to Boston from Atlanta via the road using the car!

Here the  $x_1$  place is empty: the listener must guess from context who is going to Boston. In Example 9.2.4, “klama” is glossed “a goer” rather than “go” because “Go” at the beginning of an English sentence would suggest a command: “Go to Boston!”. Example 9.2.4 is not a command, simply a normal statement with the  $x_1$  place unspecified, causing the emphasis to fall on the selbri “klama”. Such a bridi, with empty  $x_1$ , is called an *observative*, because it usually calls on the listener to observe something in the environment which would belong in the  $x_1$  place. The third translation above shows this observative nature. Sometimes it is the relationship itself which the listener is asked to observe.

(There is a way to both provide a sumti for the  $x_1$  place and put the selbri first in the bridi: see Example 9.3.7.)

Suppose the speaker desires to omit a place other than the  $x_1$  place? (Presumably it is obvious or, for one reason or another, not worth saying.) Places at the end may simply be dropped:

**Example 9.2.5**

mi klama la bastn. la .atlantas.  
I go to-Boston from-Atlanta (via an unspecified route, using an unspecified means).

Example 9.2.5 has empty  $x_4$  and  $x_5$  places: the speaker does not specify the route or the means of transport. However, simple omission will not work for a place when the places around it are to be specified: in

**Example 9.2.6**

mi klama la bastn. la .atlantas. le karce  
I go to-Boston from-Atlanta via-the car.

“le karce” occupies the  $x_4$  place, and therefore Example 9.2.6 means:

**Example 9.2.7**

I go to Boston from Atlanta, using the car as a route. This is nonsense, since a car cannot be a route. What the speaker presumably meant is expressed by:

**Example 9.2.8**

mi klama la bastn. la .atlantas. zo'e le karce  
I go to-Boston from-Atlanta via-something-unspecified using-the car.

Here the sumti cmavo “zo'e” is used to explicitly fill the  $x_4$  place; “zo'e” means “the unspecified thing” and has the same meaning as leaving the place empty: the listener must infer the correct meaning from context.

## 9.3 Tagging places: FA

The following cmavo are discussed in this section:

**Definition 9.3**

<i>fa</i>	tags $x_1$ place	FA
<i>fe</i>	tags $x_2$ place	FA
<i>fi</i>	tags $x_3$ place	FA
<i>fo</i>	tags $x_4$ place	FA
<i>fu</i>	tags $x_5$ place	FA
<i>fi'a</i>	place structure question	FA

In sentences like Example 9.2.1, it is easy to get lost and forget which sumti falls in which place, especially if the sumti are more complicated than simple names or descriptions. The place structure tags of selma'o FA may be used to help clarify place structures. The five cmavo “fa”, “fe”, “fi”, “fo”, and “fu” may be inserted just before the sumti in the  $x_1$  to  $x_5$  places respectively:

**Example 9.3.1**

fa mi cu klama fe la bastn. fi la .atlantas. fo le dargu fu le karce  
 $x_1 =$  I go  $x_2 =$  Boston  $x_3 =$  Atlanta  $x_4 =$  the road  $x_5 =$  the car.  
I go to Boston from Atlanta via the road using the car.

In Example 9.3.1, the tag “fu” before “le karce” clarifies that “le karce” occupies the  $x_5$  place of “klama”. The use of “fu” tells us nothing about the purpose or meaning of the  $x_5$  place; it simply says that “le karce” occupies it.

In Example 9.3.1, the tags are overkill; they serve only to make Example 9.2.1 even longer than it is. Here is a better illustration of the use of FA tags for clarification:

**Example 9.3.2**

fa mi klama fe le zdani be mi be'o poi nurma vau fi la nu,IORK.  
 $x_1 =$  I go  $x_2 =$  (the house of me) which is-rural  $x_3 =$  New York.

In Example 9.3.2, the place structure of “klama” is as follows:

**Definition 9.4**

$x_1$	agent	mi
$x_2$	destinati	on le zdani be mi be'o poi nurma vau
$x_3$	origin	la nu,IORK.
$x_4$	route	(empty)
$x_5$	means	(empty)

The “fi” tag serves to remind the hearer that what follows is in the  $x_3$  place of “klama”; after listening to the complex sumti occupying the  $x_2$  place, it’s easy to get lost.

Of course, once the sumti have been tagged, the order in which they are specified no longer carries the burden of distinguishing the places. Therefore, it is perfectly all right to scramble them into any order desired, and to move the selbri to anywhere in the bridi, even the beginning:

**Example 9.3.3**

klama fa mi fi la .atlantas. fu le karce fe la bastn. fo le dargu  
 go  $x_1 =$  I  $x_3 =$  Atlanta  $x_5 =$  the car  $x_2 =$  Boston  $x_4 =$  the road.  
 Go I from Atlanta using the car to Boston via the road.

Note that no “cu” is permitted before the selbri in Example 9.3.3, because “cu” separates the selbri from any preceding sumti, and Example 9.3.3 has no such sumti.

**Example 9.3.4**

fu le karce fo le dargu fi la .atlantas. fe la bastn. cu klama fa mi  
 $x_5 =$  the car  $x_4 =$  the road  $x_3 =$  Atlanta  $x_2 =$  Boston go  $x_1 =$  I  
 Using the car, via the road, from Atlanta to Boston go I.

Example 9.3.4 exhibits the reverse of the standard bridi form seen in Example 9.2.1 and Example 9.3.1, but still means exactly the same thing. If the FA tags were left out, however, producing:

**Example 9.3.5**

le karce le dargu la .atlantas. la bastn. cu klama mi  
 The car to-the road from-Atlanta via-Boston goes using-me.  
 The car goes to the road from Atlanta, with Boston as the route, using me as a means of transport.

the meaning would be wholly changed, and in fact nonsensical.

Tagging places with FA cmavo makes it easy not only to reorder the places but also to omit undesirable ones, without any need for “zo’e” or special rules about the  $x_1$  place:

**Example 9.3.6**

klama fi la .atlantas. fe la bastn. fu le karce  
 A-goer  $x_3$  = Atlanta  $x_2$  = Boston  $x_5$  = the car.  
 A goer from Atlanta to Boston using the car.

Here the  $x_1$  and  $x_4$  places are empty, and so no sumti are tagged with “fa” or “fo”; in addition, the  $x_2$  and  $x_3$  places appear in reverse order.

What if some sumti have FA tags and others do not? The rule is that after a FA-tagged sumti, any sumti following it occupy the places numerically succeeding it, subject to the proviso that an already-filled place is skipped:

**Example 9.3.7**

klama fa mi la bastn. la .atlantas. le dargu le karce  
 Go  $x_1$  = I  $x_2$  = Boston  $x_3$  = Atlanta  $x_4$  = the road  $x_5$  = the car.  
 Go I to Boston from Atlanta via the road using the car.

In Example 9.3.7, the “fa” causes “mi” to occupy the  $x_1$  place, and then the following untagged sumti occupy in order the  $x_2$  through  $x_5$  places. This is the mechanism by which Lojban allows placing the selbri first while specifying a sumti for the  $x_1$  place.

Here is a more complex (and more confusing) example:

**Example 9.3.8**

mi klama fi la .atlantas. le dargu fe la bastn. le karce  
 I go  $x_3$  = Atlanta the road  $x_2$  = Boston the car.  
 I go from Atlanta via the road to Boston using the car.

In Example 9.3.8, “mi” occupies the  $x_1$  place because it is the first sumti in the sentence (and is before the selbri). The second sumti, “la .atlantas.”, occupies the  $x_3$  place by virtue of the tag “fi”, and “le dargu” occupies the  $x_4$  place as a result of following “la .atlantas.”. Finally, “la bastn.” occupies the  $x_2$  place because of its tag “fe”, and “le karce” skips over the already-occupied  $x_3$  and  $x_4$  places to land in the  $x_5$  place.

Such a convoluted use of tags should probably be avoided except when trying for a literal translation of some English (or other natural-language) sentence; the rules stated here are merely given so that some standard interpretation is possible.

It is grammatically permitted to tag more than one sumti with the same FA cmavo. The effect is that of making more than one claim:

**Example 9.3.9**

$\langle fa \rangle$  la rik. fa la djein. klama  $\langle fe \rangle$  le skina fe le zdani fe le zarci  
 $\langle x_1 = \rangle$  Rick  $x_1$  = Jane goes-to  $x_2$  = the movie  $x_2$  = the house  $x_2$  = the office

may be taken to say that both Rick and Jane go to the movie, the house, and the office, merging six claims into one. More likely, however, it will simply confuse the listener. There are better ways, involving logical connectives (explained in Chapter 14), to say such things in Lojban. In fact, putting more than one sumti into a place is odd enough that it can only be done by explicit FA usage: this is the motivation for the proviso above, that already-occupied places are skipped. In this way, no sumti can be forced into a place already occupied unless it has an explicit FA cmavo tagging it.

The cmavo “fi’a” also belongs to selma’o FA, and allows Lojban users to ask questions about place structures. A bridi containing “fi’a” is a question, asking the listener to supply the appropriate other member of FA which will make the bridi a true statement:

**Example 9.3.10**

fi’a do dunda *(fe)* le vi rozgu  
*(what place)?* you give  $x_2 =$  the nearby rose  
 In what way are you involved in the giving of this rose?  
 Are you the giver or the receiver of this rose?

In Example 9.3.10, the speaker uses the selbri “dunda”, whose place structure is “ $x_1$  gives  $x_2$  to  $x_3$ ”.

The tagged sumti “fi’a do” indicates that the speaker wishes to know whether the sumti “do” falls in the  $x_1$  or the  $x_3$  place (the  $x_2$  place is already occupied by “le rozgu”). The listener can reply with a sentence consisting solely of a FA cmavo: “fa” if the listener is the giver, “fi” if he/she is the receiver.

I have inserted the tag “fe” in brackets into Example 9.3.10, but it is actually not necessary, because “fi’a” does not count as a numeric tag; therefore, “le vi rozgu” would necessarily be in the  $x_2$  place even if no tag were present, because it immediately follows the selbri.

There is also another member of FA, namely “fai”, which is discussed in Section 9.12.

## 9.4 Conversion: SE

The following cmavo are discussed in this section:

**Definition 9.5**

<i>se</i>	2 <sup>nd</sup> place conversion	SE
<i>te</i>	3 <sup>rd</sup> place conversion	SE
<i>ve</i>	4 <sup>th</sup> place conversion	SE
<i>xe</i>	5 <sup>th</sup> place conversion	SE

So far we have seen ways to move sumti around within a bridi, but the actual place structure of the selbri has always remained untouched. The conversion cmavo of selma’o SE are incorporated within the selbri itself, and produce a new selbri (called a *converted selbri*) with a different place structure. In particular, after the application of any SE cmavo, the number and purposes of the places remain the same, but two of them have been exchanged, the  $x_1$  place and another. Which place has been exchanged with  $x_1$  depends on the cmavo chosen. Thus, for example, when “se” is used, the  $x_1$  place is swapped with the  $x_2$  place.

Note that the cmavo of SE begin with consecutive consonants in alphabetical order. There is no “1<sup>st</sup> place conversion” cmavo, because exchanging the  $x_1$  place with itself is a pointless maneuver.

Here are the place structures of the various conversions of “klama”:

**Definition 9.6**

*se klama*  $x_1$  is the destination of  $x_2$ ’s going from  $x_3$  via  $x_4$  using  $x_5$

te klama :  $x_1$  is the origin and  $x_2$  the destination of  $x_3$  going via  $x_4$  using  $x_5$   
 ve klama :  $x_1$  is the route to  $x_2$  from  $x_3$  used by  $x_4$  going via  $x_5$   
 xe klama :  $x_1$  is the means in going to  $x_2$  from  $x_3$  via  $x_4$  employed by  $x_5$

Note that the place structure numbers in each case continue to be listed in the usual order,  $x_1$  to  $x_5$ .

Consider the following pair of examples:

**Example 9.4.1**

la bastn. cu se klama mi  
 Boston is-the-destination of-me.  
 Boston is my destination.  
 Boston is gone to by me.

**Example 9.4.2**

fe la bastn. cu klama fa mi  
 $x_2 = \text{Boston}$  go  $x_1 = \text{I}$ .  
 To Boston go I.

Example 9.4.1 and Example 9.4.2 mean the same thing, in the sense that there is a relationship of going with the speaker as the agent and Boston as the destination (and with unspecified origin, route, and means). Structurally, however, they are quite different. Example 9.4.1 has “la bastn.” in the  $x_1$  place and “mi” in the  $x_2$  place of the selbri “se klama”, and uses standard bridi order; Example 9.4.2 has “mi” in the  $x_1$  place and “la bastn.” in the  $x_2$  place of the selbri “klama”, and uses a non-standard order. The most important use of conversion is in the construction of descriptions. A description is a sumti which begins with a cmavo of selma’o LA or LE, called *the descriptor*, and contains (in the simplest case) a selbri. We have already seen the descriptions “le dargu” and “le karce”. To this we could add:

**Example 9.4.3**

le klama  
 the go-er, the one who goes

In every case, the description is about something which fits into the  $x_1$  place of the selbri. In order to get a description of a destination (that is, something fitting the  $x_2$  place of “klama”), we must convert the selbri to “se klama”, whose  $x_1$  place is a destination. The result is

**Example 9.4.4**

le se klama  
 the destination gone to by someone

Likewise, we can create three more converted descriptions:

**Example 9.4.5**

le te klama  
 the origin of someone’s going

**Example 9.4.6**

le ve klama  
 the route of someone’s going



**Example 9.4.7**

le xe klama  
the means by which someone goes

Example 9.4.6 does not mean “the route” plain and simple: that is “le pluta”, using a different selbri. It means a route that is used by someone for an act of “klama”; that is, a journey with origin and destination. A “road” on Mars, on which no one has traveled or is ever likely to, may be called “le pluta”, but it cannot be “le ve klama”, since there exists no one for whom it is “le ve klama be fo da” (the route taken in an actual journey by someone *(da)*).

When converting selbri that are more complex than a single brivla, it is important to realize that the scope of a SE cmavo is only the following brivla (or equivalent unit). In order to convert an entire tanru, it is necessary to enclose the tanru in “ke ... ke’e” brackets:

**Example 9.4.8**

mi se ke blanu zdani *(ke’e)* ti  
I *(2<sup>nd</sup> conversion)* blue house this-thing

The place structure of “blanu zdani” (blue house) is the same as that of “zdani”, by the rule given in Section 9.1. The place structure of “zdani” is “ $x_1$  is a house/nest/lair/den for inhabitant  $x_2$ ”. The place structure of “se ke blanu zdani [ke’e]” is therefore “ $x_1$  is the inhabitant of the blue house (etc.)  $x_2$ ”. Consequently, Example 9.4.8 means “I am the inhabitant of the blue house which is this thing.” Conversion applied to only part of a tanru has subtler effects which are explained in Chapter 5.

It is grammatical to convert a selbri more than once with SE; later (inner) conversions are applied before earlier (outer) ones. For example, the place structure of “se te klama” is achieved by exchanging the  $x_1$  and  $x_2$  place of “te klama”, producing “ $x_1$  is the destination and  $x_2$  is the origin of  $x_3$  going via  $x_4$  using  $x_5$ ”. On the other hand, “te se klama” has a place structure derived from swapping the  $x_1$  and  $x_3$  places of “se klama”: “ $x_1$  is the origin of  $x_2$ ’s going to  $x_3$  via  $x_4$  using  $x_5$ ”, which is quite different. However, multiple conversions like this are never necessary. Arbitrary scrambling of places can be achieved more easily and far more intelligibly with FA tags, and only a single conversion is ever needed in a description.

(Although no one has made any real use of it, it is perhaps worth noting that compound conversions of the form “setese”, where the first and third cmavo are the same, effectively swap the two given places while leaving the others, including  $x_1$ , alone: “setese” (or equivalently “tesete”) swap the  $x_2$  and  $x_3$  places, whereas “texete” (or “xetexe”) swap the  $x_3$  and  $x_5$  places.)

## 9.5 Modal places: FIhO, FEhU

The following cmavo are discussed in this section:

**Definition 9.7**

<i>fi'o</i>	modal place prefix	<i>FIhO</i>
<i>fe'u</i>	modal terminator	<i>FEhU</i>

Sometimes the place structures engineered into Lojban are inadequate to meet the needs of actual speech. Consider the gismu “viska”, whose place structure is “ $x_1$  sees  $x_2$  under conditions  $x_3$ ”. Seeing is a threefold relationship, involving an agent (le viska), an object of sight

(le se viska), and an environment that makes seeing possible (le te viska). Seeing is done with one or more eyes, of course; in general, the eyes belong to the entity in the  $x_1$  place.

Suppose, however, that you are blind in one eye and are talking to someone who doesn't know that. You might want to say, "I see you with the left eye." There is no place in the place structure of "viska" such as "with eye  $x_4$ " or the like. Lojban allows you to solve the problem by adding a new place, changing the relationship:

**Example 9.5.1**

mi viska do fi'o kanla (fe'u) le zunle  
 I see you ⟨modal⟩ eye: the left-thing  
 I see you with the left eye.

The three-place relation "viska" has now acquired a fourth place specifying the eye used for seeing. The combination of the cmavo "fi'o" (of selma'o FIhO) followed by a selbri, in this case the gismu "kanla", forms a tag which is prefixed to the sumti filling the new place, namely "le zunle". The semantics of "fi'o kanla le zunle" is that "le zunle" fills the  $x_1$  place of "kanla", whose place structure is " $x_1$  is an/the eye of body  $x_2$ ". Thus "le zunle" is an eye. The  $x_2$  place of "kanla" is unspecified and must be inferred from the context. It is important to remember that even though "le zunle" is placed following "fi'o kanla", semantically it belongs in the  $x_1$  place of "kanla". The selbri may be terminated with "fe'u" (of selma'o FEhU), an elidable terminator which is rarely required unless a non-logical connective follows the tag (omitting "fe'u" in that case would make the connective affect the selbri).

The term for such an added place is a "modal place", as distinguished from the regular numbered places. (This use of the word "modal" is specific to the Loglan Project, and does not agree with the standard uses in either logic or linguistics, but is now too entrenched to change easily.) The "fi'o" construction marking a modal place is called a *modal tag*, and the sumti which follows it a "modal sumti"; the purely Lojban terms "sumti tcita" and "selcita sumti", respectively, are also commonly used. Modal sumti may be placed anywhere within the bridi, in any order; they have no effect whatever on the rules for assigning unmarked bridi to numbered places, and they may not be marked with FA cmavo.

Consider Example 9.5.1 again. Another way to view the situation is to consider the speaker's left eye as a tool, a tool for seeing. The relevant selbri then becomes "pilno", whose place structure is " $x_1$  uses  $x_2$  as a tool for purpose  $x_3$ " and we can rewrite Example 9.5.1 as:

**Example 9.5.2**

mi viska do fi'o se pilno le zunle kanla  
 I see you ⟨modal⟩ ⟨conversion⟩ use: the left eye  
 I see you using my left eye.

Here the selbri belonging to the modal is "se pilno". The conversion of "pilno" is necessary in order to get the "tool" place into  $x_1$ , since only  $x_1$  can be the modal sumti. The "tool user" place is the  $x_2$  of "se pilno" (because it is the  $x_1$  of "pilno") and remains unspecified. The tag "fi'o pilno" would mean "with tool user", leaving the tool unspecified.

## 9.6 Modal tags: BAI

There are certain selbri which seem particularly useful in constructing modal tags. In particular, "pilno" is one of them. The place structure of "pilno" is " $x_1$  uses tool  $x_2$ " and almost

any selbri which represents an action may need to specify a tool. Having to say “fi’o se pilno” frequently would make many Lojban sentences unnecessarily verbose and clunky, so an abbreviation is provided in the language design: the compound cmavo “sepi’o”.

Here “se” is used before a cmavo, namely “pi’o”, rather than before a brivla. The meaning of this cmavo, which belongs to selma’o BAI, is exactly the same as that of “fi’o pilno fe’u”. Since what we want is a tag based on “se pilno” rather than “pilno” — the tool, not the tool user — the grammar allows a BAI cmavo to be converted using a SE cmavo. Example 9.5.2 may therefore be rewritten as:

**Example 9.6.1**

mi viska do sepi’o le zunle kanla  
I see you with-tool: the left eye  
I see you using my left eye.

The compound cmavo “sepi’o” is much shorter than “fi’o se pilno [fe’u]” and can be thought of as a single word meaning “with-tool”. The modal tag “pi’o”, with no “se”, similarly means “with-tool-user”, probably a less useful concept. Nevertheless, the parallelism with the place structure of “pilno” makes the additional syllable worthwhile.

Some BAI cmavo make sense with as well as without a SE cmavo; for example, “ka’a”, the BAI corresponding to the gismu “klama”, has five usable forms corresponding to the five places of “klama” respectively:

**Definition 9.8**

<i>ka’a</i>	with-goer
<i>seka’a</i>	with-destination
<i>teka’a</i>	with-origin
<i>veka’a</i>	with-route
<i>xeka’a</i>	with-means-of-transport

Any of these tags may be used to provide modal places for bridi, as in the following examples:

**Example 9.6.2**

la .eivn. cu vecnu loi flira cinta ka’a mi  
Avon sells a-mass-of face paint with-goer me.  
I am a traveling cosmetics salesperson for Avon.

(Example 9.6.2 may seem a bit strained, but it illustrates the way in which an existing selbri, “vecnu” in this case, may have a place added to it which might otherwise seem utterly unrelated.)

**Example 9.6.3**

mi cadzu seka’a la bratfyd.  
I walk with-destination Bradford.  
I am walking to Bradford.

**Example 9.6.4**

bloti teka’a la nu,IORK.  
<Observative:> is-a-boat with-origin New York  
A boat from New York!

**Example 9.6.5**

do bajra veka'a lo djine  
 You run with-route a circle.  
 You are running in circles.

**Example 9.6.6**

mi citka xeka'a le vinji  
 I eat with-means-of-transport the airplane.  
 I eat in the airplane.

There are sixty-odd cmavo of selma'o BAI, based on selected gismu that seemed useful in a variety of settings. The list is somewhat biased toward English, because many of the cmavo were selected on the basis of corresponding English prepositions and preposition compounds such as “with”, “without”, and “by means of”. The BAI cmavo, however, are far more precise than English prepositions, because their meanings are fixed by the place structures of the corresponding gismu.

All BAI cmavo have the form CV'V or CVV. Most of them are CV'V, where the C is the first consonant of the corresponding gismu and the two Vs are the two vowels of the gismu. The table in Section 9.16 shows the exceptions.

There is one additional BAI cmavo that is not derived from a gismu: “do'e”. This cmavo is used when an extra place is needed, but it seems useful to be vague about the semantic implications of the extra place:

**Example 9.6.7**

lo nanmu be do'e le berti cu klama le tcadu  
 Some man *<related to>* the north came to-the city.  
 A man of the north came to the city.

Here “le berti” is provided as a modal place of the selbri “nanmu”, but its exact significance is vague, and is paralleled in the colloquial translation by the vague English preposition “of”. Example 9.6.7 also illustrates a modal place bound into a selbri with “be”. This construction is useful when the selbri of a description requires a modal place; this and other uses of “be” are more fully explained in Chapter 5.

## 9.7 Modal sentence connection: the causals

The following cmavo are discussed in this section:

**Definition 9.9**

<i>ri'ax</i>	rinka modal: physical cause	BAI
<i>ki'ux</i>	krinu modal: justification	BAI
<i>mu'i</i>	mukti modal: motivation	BAI
<i>ni'i</i>	nibli modal: logical entailment	BAI

This section has two purposes. On the one hand, it explains the grammatical construct called *modal sentence connection*. On the other, it exemplifies some of the more useful BAI cmavo: the causals. (There are other BAI cmavo which have causal implications: “ja'e” means

“with result”, and so “seja’e” means “with cause of unspecified nature”; likewise, “gau” means “with agent” and “tezu’e” means “with purpose”. These other modal cmavo will not be further discussed here, as my purpose is to explain modal sentence connection rather than Lojbanic views of causation.)

There are four causal gismu in Lojban, distinguishing different versions of the relationships lumped in English as “causal”:

**Definition 9.10**

<i>rinka</i>	event $x_1$ physically causes event $x_2$
<i>krinu</i>	event $x_1$ is the justification for event $x_2$
<i>mukti</i>	event $x_1$ is the (human) motive for event $x_2$
<i>nibli</i>	event $x_1$ logically entails event $x_2$

Each of these gismu has a related modal: “ri’a”, “ki’u”, “mu’i”, and “ni’i” respectively. Using these gismu and these modals, we can create various causal sentences with different implications:

**Example 9.7.1**

le spati cu banro ri’a le nu do djacu dunda fi le spati  
 the plant grows with-physical-cause the event-of you water give to the plant.  
 The plant grows because you water it.

**Example 9.7.2**

la djan. cpacu le pamoi se jinga ki’u le nu la djan. jinga  
 John gets the first prize with-justification the event-of John wins.  
 John got the first prize because he won.

**Example 9.7.3**

mi lebna le cukta mu’i le nu mi viska le cukta  
 I took the book with-motivation the event-of I saw the book.  
 I took the book because I saw it.

**Example 9.7.4**

la sokrates. morsi binxo ni’i le nu la sokrates. remna  
 Socrates dead-became with-logical-justification Socrates is-human.  
 Socrates died because Socrates is human.

In Example 9.7.1 through Example 9.7.4, the same English word “because” is used to translate all four modals, but the types of cause being expressed are quite different. Let us now focus on Example 9.7.1, and explore some variations on it.

As written, Example 9.7.1 claims that the plant grows, but only refers to the event of watering it in an abstraction brididi (abstractions are explained in Chapter 11) without actually making a claim. If I express Example 9.7.1, I have said that the plant in fact grows, but I have not said that you actually water it, merely that there is a causal relationship between watering and growing. This is semantically asymmetrical. Suppose I wanted to claim that the plant was being watered, and only mention its growth as ancillary information? Then we could reverse the main brididi and the abstraction brididi, saying:

**Example 9.7.5**

do djacu dunda fi le spati seri'a le nu ri banro  
 You water-give to the plant with-physical-effect it grows.  
 You water the plant; therefore, it grows.

with the “ri’a” changed to “seri’a”. In addition, there are also symmetrical forms:

**Example 9.7.6**

le nu do djacu dunda fi le spati cu rinka le nu le spati cu banro  
 The event-of (you water-give to the plant) causes the event-of (the plant grows).  
 Your watering the plant causes its growth.  
 If you water the plant, then it grows.

does not claim either event, but asserts only the causal relationship between them. So in Example 9.7.6, I am not saying that the plant grows nor that you have in fact watered it. The second colloquial translation shows a form of “if-then” in English quite distinct from the logical connective “if-then” explained in Chapter 14. Suppose we wish to claim both events as well as their causal relationship? We can use one of two methods:

**Example 9.7.7**

le spati cu banro .iri'abo do djacu dunda fi le spati  
 The plant grows. Because you water-give to the plant.  
 The plant grows because you water it.

**Example 9.7.8**

do djacu dunda fi le spati  
 .iseri'abo le spati cu banro  
 You water-give to the plant.  
 Therefore it grows.  
 You water the plant; therefore, it grows.

The compound cmavo “.iri’abo” and “.iseri’abo” serve to connect two bridi, as the initial “.i” indicates. The final “bo” is necessary to prevent the modal from “taking over” the following sumti. If the “bo” were omitted from Example 9.7.7 we would have:

**Example 9.7.9**

le spati cu banro  
 .i ri'a do djacu dunda fi le spati  
 The plant grows.  
 Because of you, ⟨something⟩ water-gives to the plant.  
 The plant grows. Because of you, water is given  
 to the plant.

Because “ri’a do” is a modal sumti in Example 9.7.9, there is no longer an explicit sumti in the  $x_1$  place of “djacu dunda”, and the translation must be changed.

The effect of sentences like Example 9.7.7 and Example 9.7.8 is that the modal, “ri’a” in this example, no longer modifies an explicit sumti. Instead, the sumti is implicit, the event given by a full bridi. Furthermore, there is a second implication: that the first bridi fills the  $x_2$  place of

the gismu “rinka”; it specifies an event which is the effect. I am therefore claiming three things: that the plant grows, that you have watered it, and that there is a cause-and-effect relationship between the two.

In principle, any modal tag can appear in a sentence connective of the type exemplified by Example 9.7.7 and Example 9.7.8. However, it makes little sense to use any modals which do not expect events or other abstractions to fill the places of the corresponding gismu. The sentence connective “.ibaubo” is perfectly grammatical, but it is hard to imagine any two sentences which could be connected by an “in-language” modal. This is because a sentence describes an event, and an event can be a cause or an effect, but not a language.

## 9.8 Other modal connections

Like many Lojban grammatical constructions, sentence modal connection has both forethought and afterthought forms. (See Chapter 14 for a more detailed discussion of Lojban connectives.) Section 9.7 exemplifies only afterthought modal connection, illustrated here by:

### Example 9.8.1

mi jgari lei djacu .iri' abo mi jgari le kabri  
 I grasp the-mass-of water with-physical-cause I grasp the cup.  
 Causing the mass of water to be grasped by me, I grasped the cup.  
 I grasp the water because I grasp the cup.

An afterthought connection is one that is signaled only by a cmavo (or compound cmavo, in this case) between the two constructs being connected. Forethought connection uses a signal both before the first construct and between the two: the use of “both” and “and” in the first half of this sentence represents a forethought connection (though not a modal one). To make forethought modal sentence connections in Lojban, place the modal plus “gi” before the first bridi, and “gi” between the two. No “.i” is used within the construct. The forethought equivalent of Example 9.8.1 is:

### Example 9.8.2

ri'agi mi jgari le kabri gi mi jgari lei djacu  
 With-physical-cause I grasp the cup, I grasp the-mass-of water.  
 Because I grasp the cup, I grasp the water.

Note that the cause, the  $x_1$  of “rinka” is now placed first. To keep the two bridi in the original order of Example 9.8.1, we could say:

### Example 9.8.3

seri'agi mi jgari lei djacu gi mi jgari le kabri  
 With-physical-effect I grasp the-mass-of water, I grasp the cup.

In English, the sentence “\*Therefore I grasp the water, I grasp the cup” is ungrammatical, because “therefore” is not grammatically equivalent to “because”. In Lojban, “seri'agi” can be used just like “ri'agi”.

When the two bridi joined by a modal connection have one or more elements (selbri or sumti or both) in common, there are various condensed forms that can be used in place of full modal sentence connection with both bridi completely stated.

When the bridi are the same except for a single sumti, as in Example 9.8.1 through Example 9.8.3, then a sumti modal connection may be employed:

**Example 9.8.4**

mi jgari ri'agi le kabri gi lei djacu  
I grasp because the cup , the-mass-of water.

Example 9.8.4 means exactly the same as Example 9.8.1 through Example 9.8.3, but there is no idiomatic English translation that will distinguish it from them.

If the two connected bridi are different in more than one sumti, then a termset may be employed. Termsets are explained more fully in Chapter 14, but are essentially a mechanism for creating connections between multiple sumti simultaneously.

**Example 9.8.5**

mi dunda le cukta la djan.  
.imu'ibo la djan. dunda lei jdini mi  
I gave the book to John.  
Motivated-by John gave the-mass-of money to-me.  
I gave the book to John, because John gave money to me.

means the same as:

**Example 9.8.6**

nu'i mu'igi mi le cukta la djan. gi la djan. lei jdini mi nu'u dunda  
<start> because I, the book, John; John, the-mass-of money, me <end> gives.

Here there are three sumti in each half of the termset, because the two bridi share only their selbri.

There is no modal connection between selbri as such: bridi which differ only in the selbri can be modally connected using bridi-tail modal connection. The bridi-tail construct is more fully explained in Chapter 14, but essentially it consists of a selbri with optional sumti following it. Example 9.7.3 is suitable for bridi-tail connection, and could be shortened to:

**Example 9.8.7**

mi mu'igi viska le cukta gi lebna le cukta  
I, because saw the book, took the book.

Again, no straightforward English translation exists. It is even possible to shorten Example 9.8.7 further to:

**Example 9.8.8**

mi mu'igi viska gi lebna vau le cukta  
I because saw, therefore took, the book.

where “le cukta” is set off by the non-elidable “vau” and is made to belong to both bridi-tails — see Chapter 14 for more explanations.

Since this is a chapter on rearranging sumti, it is worth pointing out that Example 9.8.8 can be further rearranged to:



**Example 9.8.9**

mi le cukta mu'igi viska gi lebna  
I, the book, because saw, therefore took

which doesn't require the extra "vau"; all sumti before a conjunction of bridi-tails are shared. Finally, mathematical operands can be modally connected.

**Example 9.8.10**

li ny. du li vo  
.ini'ibo li ny. du li re su'i re  
the number  $n$  = the-number 4.  
Entailed-by the-number  $n$  = the-number  $2 + 2$ .  
 $n = 4$  because  $n = 2 + 2$ .

can be reduced to:

**Example 9.8.11**

li ny. du li ni'igi vei re su'i re  $\langle ve'o \rangle$  gi vo  
the-number  $n$  = the-number because  $(2 + 2)$  therefore 4.  
 $n$  is  $2 + 2$ , and is thus 4.

The cmavo "vei" and "ve'o" represent mathematical parentheses, and are required so that "ni'igi" affects more than just the immediately following operand, namely the first "re". (The right parenthesis, "ve'o", is an elidable terminator.) As usual, no English translation does Example 9.8.11 justice.

Note: Due to restrictions on the Lojban parsing algorithm, it is not possible to form modal connectives using the "fi'o"-plus-selbri form of modal. Only the predefined modals of selma'o BAI can be compounded as shown in Section 9.7 and Section 9.8.

## 9.9 Modal selbri

Consider the example:

**Example 9.9.1**

mi tavla bau la lojban. bai tu'a la frank.  
I speak in-language Lojban with-compeller some-property-of Frank.  
I speak in Lojban, under compulsion by Frank.

Example 9.9.1 has two modal sumti, using the modals "bau" and "bai". Suppose we wanted to specify the language explicitly but be vague about who's doing the compelling. We can simplify Example 9.9.1 to:

**Example 9.9.2**

mi tavla bau la lojban. bai  $\langle ku \rangle$ .  
I speak in-language Lojban under-compulsion.

In Example 9.9.2, the elidable terminator "ku" has taken the place of the sumti which would normally follow "bai". Alternatively, we could specify the one who compels but keep the language vague:

**Example 9.9.3**

mi tavla bau <ku> bai tu'a la frank.  
I speak in-some-language under-compulsion-by some-property-of Frank.

We are also free to move the modal-plus-“ku” around the bridi:

**Example 9.9.4**

bau <ku> bai ku mi tavla  
In-some-language under-compulsion I speak.

An alternative to using “ku” is to place the modal cmavo right before the selbri, following the “cu” which often appears there. When a modal is present, the “cu” is almost never necessary.

**Example 9.9.5**

mi bai tavla bau la lojban.  
I compelledly speak in-language Lojban.

In this use, the modal is like a tanru modifier semantically, although grammatically it is quite distinct. Example 9.9.5 is very similar in meaning to:

**Example 9.9.6**

mi se bapli tavla bau la lojban.  
I compelledly-speak in-language Lojban.

The “se” conversion is needed because “bapli tavla” would be a compeller type of speaker rather than a compelled (by someone) type of speaker, which is what a “bai tavla” is.

If the modal preceding a selbri is constructed using “fi'o”, then “fe'u” is required to prevent the main selbri and the modal selbri from colliding:

**Example 9.9.7**

mi fi'o kanla fe'u viska do  
I with-eye see you  
I see you with my eye(s).

There are two other uses of modals. A modal can be attached to a pair of bridi-tails that have already been connected by a logical, non-logical, or modal connection (see Chapter 14 for more on logical and non-logical connections):

**Example 9.9.8**

mi bai ke ge klama le zarci gi cadzu le bisli <ke'e>  
I under-compulsion (both go to-the market and walk on-the ice)  
Under compulsion, I both go to the market and walk on the ice.

Here the “bai” is spread over both “klama le zarci” and “cadzu le bisli”, and the “ge ... gi” represents the logical connection “both-and” between the two.

Similarly, a modal can be attached to multiple sentences that have been combined with “tu'e” and “tu'u”, which are explained in more detail in Chapter 19:

**Example 9.9.9**

bai tu'e mi klama le zarci .i mi cadzu le bisli <tu'u>  
 Under-compulsion <start> I go to-the market. I walk on-the ice <end>

means the same thing as Example 9.9.8. Note: Either BAI modals or “fi'o”-plus-selbri modals may correctly be used in any of the constructions discussed in this section.

## 9.10 Modal relative phrases; Comparison

The following cmavo are discussed in this section:

**Definition 9.11**

<i>pe</i>	restrictive relative phrase	<i>GOI</i>
<i>ne</i>	incidental relative phrase	<i>GOI</i>
<i>mau</i>	zmadu modal	<i>BAI</i>
<i>me'a</i>	mleca modal	<i>BAI</i>

Relative phrases and clauses are explained in much more detail in Chapter 8. However, there is a construction which combines a modal with a relative phrase which is relevant to this chapter. Consider the following examples of relative clauses:

**Example 9.10.1**

la .apasionatas. poi se cusku la .artr. rubnstain. cu se nelci mi  
 The Appassionata which is-expressed-by Artur Rubenstein is-liked-by me.

**Example 9.10.2**

la .apasionatas. noi se finti la betovn. cu se nelci mi  
 The Appassionata, which is-created-by Beethoven, is-liked-by me.

In Example 9.10.1, “la .apasionatas.” refers to a particular performance of the sonata, namely the one performed by Rubenstein. Therefore, the relative clause “poi se cusku” uses the cmavo “poi” (of selma'o NOI) to restrict the meaning of “la .apasionatas” to the performance in question.

In Example 9.10.2, however, “la .apasionatas.” refers to the sonata as a whole, and the information that it was composed by Beethoven is merely incidental. The cmavo “noi” (also of selma'o NOI) expresses the incidental nature of this relationship.

The cmavo “pe” and “ne” (of selma'o GOI) are roughly equivalent to “poi” and “noi” respectively, but are followed by sumti rather than full bridi. We can abbreviate Example 9.10.1 and Example 9.10.2 to:

**Example 9.10.3**

la .apasionatas pe la .artr. rubnstain. se nelci mi  
 The Appassionata of Artur Rubenstein is-liked-by me.

**Example 9.10.4**

la .apasionatas ne la betovn. se nelci mi  
 The Appassionata, which is of Beethoven, is-liked-by me.

Here the precise selbri of the relative clauses is lost: all we can tell is that the Appassionata is connected in some way with Rubenstein (in Example 9.10.3) and Beethoven (in Example 9.10.4), and that the relationships are respectively restrictive and incidental. It happens that both “cusku” and “finti” have BAI cmavo, namely “cu’u” and “fi’e”. We can recast Example 9.10.3 and Example 9.10.4 as:

**Example 9.10.5**

la .apasionatas pe cu’u la .artr. rubnstain. cu se nelci mi  
The Appassionata expressed-by Artur Rubenstein is-liked-by me.

**Example 9.10.6**

la .apasionatas ne fi’e la betovn. cu se nelci mi  
The Appassionata, invented-by Beethoven, is-liked-by me.

Example 9.10.5 and Example 9.10.6 have the full semantic content of Example 9.10.1 and Example 9.10.2 respectively. Modal relative phrases are often used with the BAI cmavo “mau” and “me’a”, which are based on the comparative gismu “zmadu” (more than) and “mleca” (less than) respectively. The place structures are:

**Definition 9.12**

*zmadu*  $x_1$  is more than  $x_2$  in property/quantity  $x_3$  by amount  $x_4$   
*mleca*  $x_1$  is less than  $x_2$  in property/quantity  $x_3$  by amount  $x_4$

Here are some examples:

**Example 9.10.7**

la frank. nelci la betis. ne semau la meiris.  
Frank likes Betty, which-is more-than Mary.  
Frank likes Betty more than (he likes) Mary.

Example 9.10.7 requires that Frank likes Betty, but adds the information that his liking for Betty exceeds his liking for Mary. The modal appears in the form “semau” because the  $x_2$  place of “zmadu” is the basis for comparison: in this case, Frank’s liking for Mary.

**Example 9.10.8**

la frank. nelci la meiris. ne seme’a la betis.  
Frank likes Mary, which-is less-than Betty.  
Frank likes Mary less than (he likes) Betty.

Here we are told that Frank likes Mary less than he likes Betty; the information about the comparison is the same. It would be possible to rephrase Example 9.10.7 using “me’a” rather than “semau”, and Example 9.10.8 using “mau” rather than “seme’a”, but such usage would be unnecessarily confusing. Like many BAI cmavo, “mau” and “me’a” are more useful when converted with “se”.

If the “ne” were omitted in Example 9.10.7 and Example 9.10.8, the modal sumti (“la meiris.” and “la betis.” respectively) would become attached to the bridi as a whole, producing a very different translation. Example 9.10.8 would become:

**Example 9.10.9**

la frank. nelci la meiris. seme'a la betis.  
 Frank likes Mary is-less-than Betty.  
 Frank's liking Mary is less than Betty.

which compares a liking with a person, and is therefore nonsense. Pure comparison, which states only the comparative information but says nothing about whether Frank actually likes either Mary or Betty (he may like neither, but dislike Betty less), would be expressed differently, as:

**Example 9.10.10**

le ni la frank. nelci la betis.  
 cu zmadu le ni la frank. nelci la meiris.  
 The quantity-of Frank's liking Betty  
 is-more-than the quantity-of Frank's liking Mary.

The mechanisms explained in this section are appropriate to many modals other than “se-mau” and “seme'a”. Some other modals that are often associated with relative phrases are: “seba'i” (“instead of”), “ci'u” (“on scale”), “de'i” (“dated”), “du'i” (“as much as”). Some BAI tags can be used equally well in relative phrases or attached to bridri; others seem useful only attached to bridri. But it is also possible that the usefulness of particular BAI modals is an English-speaker bias, and that speakers of other languages may find other BAIs useful in divergent ways.

Note: The uses of modals discussed in this section are applicable both to BAI modals and to “fi'o”-plus-selbri modals.

## 9.11 Mixed modal connection

It is possible to mix logical connection (explained in Chapter 14) with modal connection, in a way that simultaneously asserts the logical connection and the modal relationship. Consider the sentences:

**Example 9.11.1**

mi nelci do .ije mi nelci la djein.  
 I like you. And I like Jane

which is a logical connection, and

**Example 9.11.2**

mi nelci do .iki'ubo mi nelci la djein.  
 I like you. Justified-by I like Jane.

The meanings of Example 9.11.1 and Example 9.11.2 can be simultaneously expressed by combining the two compound cmavo, thus:

**Example 9.11.3**

mi nelci do .ijeki'ubo mi nelci la djein.  
 I like you. And justified-by I like Jane.

Here the two sentences “mi nelci do” and “mi nelci la djein.” are simultaneously asserted, their logical connection is asserted, and their causal relationship is asserted. The logical connective “je” comes before the modal “ki’u” in all such mixed connections.

Since “mi nelci do” and “mi nelci la djein.” differ only in the final sumti, we can transform Example 9.11.3 into a mixed sumti connection:

**Example 9.11.4**

mi nelci do .eki’ubo la djein.  
I like you and/because Jane.

Note that this connection is an afterthought one. Mixed connectives are always afterthought; forethought connectives must be either logical or modal. There are numerous other afterthought logical and non-logical connectives that can have modal information planted within them. For example, a bridi-tail connected version of Example 9.11.4 would be:

**Example 9.11.5**

mi nelci do gi’eki’ubo nelci la djein.  
I like you and/because like Jane.

The following three complex examples all mean the same thing.

**Example 9.11.6**

mi bevri le dakli  
.ijeseri’abo tu’e mi bevri le gerku  
.ijadu’ibo mi bevri le mlatu *(tu’u)*  
I carry the sack.  
And *(effect)* (I carry the dog  
And/or *(equal)* I carry the cat.)  
I carry the sack.  
As a result I carry the dog  
or I carry the cat, equally.

**Example 9.11.7**

mi bevri le dakli gi’eseri’ake bevri le gerku gi’adu’ibo bevri le mlatu *(ke’e)*  
I carry the sack and *(effect)* (carry the dog and/or *(equal)* carry the cat).  
I carry the sack and as a result carry the dog or carry the cat equally.

**Example 9.11.8**

mi bevri le dakli .eseri’ake le gerku .adu’ibo le mlatu *(ke’e)*  
I carry the sack and *(effect)* (the cat and/or *(equal)* the dog).  
I carry the sack, and as a result the cat or the dog equally.

In Example 9.11.6, the “tu’e ... tu’u” brackets are the equivalent of the “ke ... ke’e” brackets in Example 9.11.7 and Example 9.11.8, because “ke ... ke’e” cannot extend across more than one sentence. It would also be possible to change the “.ijeseri’abo” to “.ije seri’a”, which would show that the “tu’e ... tu’u” portion was an effect, but would not pin down the “mi bevri le dakli” portion as the cause. It is legal for a modal (or a tense; see Chapter 10) to modify the whole of a “tu’e ... tu’u” construct.

Note: The uses of modals discussed in this section are applicable both to BAI modals and to “fi’o”-plus-selbri modals.

## 9.12 Modal conversion: JAI

The following cmavo are discussed in this section:

### Definition 9.13

<i>jai</i>	modal conversion	<i>JAI</i>
<i>fai</i>	modal place structure tag	<i>FA</i>

So far, conversion of numbered bridi places with SE and the addition of modal places with BAI have been two entirely separate operations. However, it is possible to convert a selbri in such a way that, rather than exchanging two numbered places, a modal place is made into a numbered place. For example,

### Example 9.12.1

mi cusku bau la lojban.  
I express *<something>* in-language Lojban.

has an explicit  $x_1$  place occupied by “mi” and an explicit “bau” place occupied by “la lojban.” To exchange these two, we use a modal conversion operator consisting of “jai” (of selma’o JAI) followed by the modal cmavo. Thus, the modal conversion of Example 9.12.1 is:

### Example 9.12.2

la lojban. jai bau cusku fai mi  
Lojban is-the-language-of-expression used-by me.

In Example 9.12.2, the modal place “la lojban.” has become the  $x_1$  place of the new selbri “jai bau cusku”. What has happened to the old  $x_1$  place? There is no numbered place for it to move to, so it moves to a special “unnumbered place” marked by the tag “fai” of selma’o FA.

Note: For the purposes of place numbering, “fai” behaves like “fi’a”; it does not affect the numbering of the other places around it.

Like SE conversions, JAI conversions are especially convenient in descriptions. We may refer to “the language of an expression” as “le jai bau cusku”, for example.

In addition, it is grammatical to use “jai” without a following modal. This usage is not related to modals, but is explained here for completeness. The effect of “jai” by itself is to send the  $x_1$  place, which should be an abstraction, into the “fai” position, and to raise one of the sumti from the abstract sub-bridi into the  $x_1$  place of the main bridi. This feature is discussed in more detail in Chapter 11. The following two examples mean the same thing:

### Example 9.12.3

le nu mi lebna le cukta cu se krinu le nu mi viska le cukta  
The event-of I take the book is-justified-by the event-of I see the book.  
My taking the book is justified by my seeing it.

### Example 9.12.4

mi jai se krinu le nu mi viska le cukta kei *<fai le nu mi lebna le cukta>*  
I am-justified by the event-of I see the book *<namely, the event-of I take the book>*  
I am justified in taking the book by seeing the book.

Example 9.12.4, with the bracketed part omitted, allows us to say that “I am justified” whereas in fact it is my action that is justified. This construction is vague, but useful in representing natural-language methods of expression.

Note: The uses of modals discussed in this section are applicable both to BAI modals and to “fi’o”-plus-selbri modals.

## 9.13 Modal negation

Negation is explained in detail in Chapter 15. There are two forms of negation in Lojban: contradictory and scalar negation. Contradictory negation expresses what is false, whereas scalar negation says that some alternative to what has been stated is true. A simple example is the difference between “John didn’t go to Paris” (contradictory negation) and “John went to (some-where) other than Paris” (scalar negation).

Contradictory negation involving BAI *cmavo* is performed by appending “-nai” (of *selma’o* NAI) to the BAI. A common use of modals with “-nai” is to deny a causal relationship:

### Example 9.13.1

mi nelci do mu’inai le nu do nelci mi  
I like you, but not because you like me.

Example 9.13.1 denies that the relationship between my liking you (which is asserted) and your liking me (which is not asserted) is one of motivation. Nothing is said about whether you like me or not, merely that that hypothetical liking is not the motivation for my liking you.

Scalar negation is achieved by prefixing “na’e” (of *selma’o* NAhE), or any of the other *cmavo* of NAhE, to the BAI *cmavo*.

### Example 9.13.2

le spati cu banro na’emu’i le nu do djacu dunda fi le spati  
The plant grows other-than-motivated-by the event-of you water-give to the plant.

Example 9.13.2 says that the relationship between the plant’s growth and your watering it is not one of motivation: the plant is not motivated to grow, as plants are not something which can have motivation as a rule. Implicitly, some other relationship between watering and growth exists, but Example 9.13.2 doesn’t say what it is (presumably “ri’a”).

Note: Modals made with “fi’o” plus a *selbri* cannot be negated directly. The *selbri* can itself be negated either with contradictory or with scalar negation, however.

## 9.14 Sticky modals

The following *cmavo* is discussed in this section:

### Definition 9.14

*ki* stickiness flag

*KI*

Like tenses, modals can be made persistent from the *bridi* in which they appear to all following *bridi*. The effect of this “stickiness” is to make the modal, along with its following *sumti*, act as if it appeared in every successive *bridi*. Stickiness is put into effect by following the modal (but not any following *sumti*) with the *cmavo* “ki” of *selma’o* KI. For example,



**Example 9.14.1**

mi tavla bau la lojban. bai ki tu'a la frank.  
 .ibabo mi tavla bau la gliban.  
 I speak in-language Lojban compelled-by some-property-of Frank.  
 Afterward, I speak in-language English.

means the same as:

**Example 9.14.2**

mi tavla bau la lojban. bai tu'a la frank.  
 .ibabo mi tavla bau la gliban. bai tu'a la frank.  
 I speak in-language Lojban compelled-by some-property-of Frank.  
 Afterward, I speak in-language English compelled-by some-property-of Frank.

In Example 9.14.1, “bai” is made sticky, and so Frank’s compelling is made applicable to every following bridi. “bau” is not sticky, and so the language may vary from bridi to bridi, and if not specified in a particular bridi, no assumption can safely be made about its value.

To cancel stickiness, use the form “BAI ki ku”, which stops any modal value for the specified BAI from being passed to the next bridi. To cancel stickiness for all modals simultaneously, and also for any sticky tenses that exist (“ki” is used for both modals and tenses), use “ki” by itself, either before the selbri or (in the form “ki ku”) anywhere in the bridi:

**Example 9.14.3**

mi ki tavla  
 I speak (no implication about language or compulsion).

Modals made with “fi'o”-plus-selbri cannot be made sticky. This is an unfortunate, but unavoidable, restriction.

## 9.15 Logical and non-logical connection of modals

Logical and non-logical connectives are explained in detail in Chapter 14. For the purposes of this chapter, it suffices to point out that a logical (or non-logical) connection between two bridi which differ only in a modal can be reduced to a single bridi with a connective between the modals. As a result, Example 9.15.1 and Example 9.15.2 mean the same thing:

**Example 9.15.1**

la frank. bajra seka'a le zdani  
 .ije la frank. bajra teka'a le zdani  
 Frank runs with-destination the house.  
 And Frank runs with-origin the house.  
 Frank runs to the house, and Frank runs from the house.

**Example 9.15.2**

la frank. bajra seka'a je teka'a le zdani  
 Frank runs with-destination and with-origin the house.  
 Frank runs to and from the house.

Neither example implies whether a single act, or two acts, of running is referred to. To compel the sentence to refer to a single act of running, you can use the form:

**Example 9.15.3**

la frank. bajra seka'a le zdani ce'e teka'a le zdani  
Frank runs with-destination the house (*joined-to*) with-origin the-house.

The cmavo “ce'e” creates a termset containing two terms (termsets are explained in Chapter 14 and Chapter 16). When a termset contains more than one modal tag derived from a single BAI, the convention is that the two tags are derived from a common event.

## 9.16 CVV cmavo of selma'o BAI with irregular forms

There are 65 cmavo of selma'o BAI, of which all but one (“do'e”, discussed in Section 9.6), are derived directly from selected gismu. Of these 64 cmavo, 36 are entirely regular and have the form CVV, where C is the first consonant of the corresponding gismu, and the Vs are the two vowels of the gismu. The remaining BAI cmavo, which are irregular in one way or another, are listed in the table below. The table is divided into sub-tables according to the nature of the exception; some cmavo appear in more than one sub-table, and are so noted.

### 9.16.1 Monosyllables of the form CVV

**Definition 9.15**

<i>bai</i>	bapli	
<i>bau</i>	bangu	
<i>cau</i>	claxu	
<i>fau</i>	fasnu	
<i>gau</i>	gasnu	
<i>kai</i>	ckaji	uses 2 <sup>nd</sup> consonant of gismu
<i>mau</i>	zmadu	uses 2 <sup>nd</sup> consonant of gismu
<i>koi</i>	korbi	
<i>rai</i>	traji	uses 2 <sup>nd</sup> consonant of gismu
<i>sau</i>	sarcu	
<i>tai</i>	tamsmi	based on <i>lujvo</i> , not gismu
<i>zau</i>	zanru	

The *lujvo* “tamsmi” on which “tai” is based is derived from the *tanru* “tarmi simsa” and has the place structure “ $x_1$  has form  $x_2$ , similar in form to  $x_3$  in property/quality  $x_4$ ”. This *lujvo* is employed because “tarmi” does not have a place structure useful for the modal’s purpose.

### 9.16.2 Second consonant of the gismu as the C

**Definition 9.16**

<i>ga'a</i>	zgana	
<i>kai</i>	ckaji	has CVV form (monosyllable)
<i>ki'i</i>	ckini	

<i>la'u</i>	klani	has irregular 2 <sup>nd</sup> V
<i>le'a</i>	klesi	has irregular 2 <sup>nd</sup> V
<i>mau</i>	zmadu	has CVV form (monosyllable)
<i>me'e</i>	cmene	
<i>ra'a</i>	srana	
<i>ra'i</i>	krasi	
<i>rai</i>	traji	has CVV form (monosyllable)
<i>ti'i</i>	stidi	
<i>tu'i</i>	stuzi	

### 9.16.3 Irregular 2<sup>nd</sup> V

#### Definition 9.17

<i>fi'e</i>	finti	
<i>la'u</i>	klani	uses 2 <sup>nd</sup> consonant of gismu
<i>le'a</i>	klesi	uses 2 <sup>nd</sup> consonant of gismu
<i>ma'e</i>	marji	
<i>mu'u</i>	mupli	
<i>ti'u</i>	tcika	
<i>va'o</i>	vanbi	

### 9.16.4 Special cases

#### Definition 9.18

<i>ri'i</i>	lifri	uses 3 <sup>rd</sup> consonant of gismu
<i>tai</i>	tamsmi	based on <i>lujvo</i> , not gismu
<i>va'u</i>	xamgu	CVV cmavo can't begin with "x"

## 9.17 Complete table of BAI cmavo with rough English equivalents

The following table shows all the cmavo belonging to selma'o BAI, and has seven columns. The first column is the cmavo itself; the second column is the gismu linked to it. The third column gives an English phrase which indicates the meaning of the cmavo; and the fourth, fifth, sixth and seventh columns indicate its meaning when preceded by "se", "te", "ve" and "xe", respectively.

It should be emphasized that the place structures of the gismu control the meanings of the BAI cmavo. The English phrases shown here are only suggestive, and are often too broad or too narrow to correctly specify what the acceptable range of uses for the modal tag are.

**Definition 9.19**

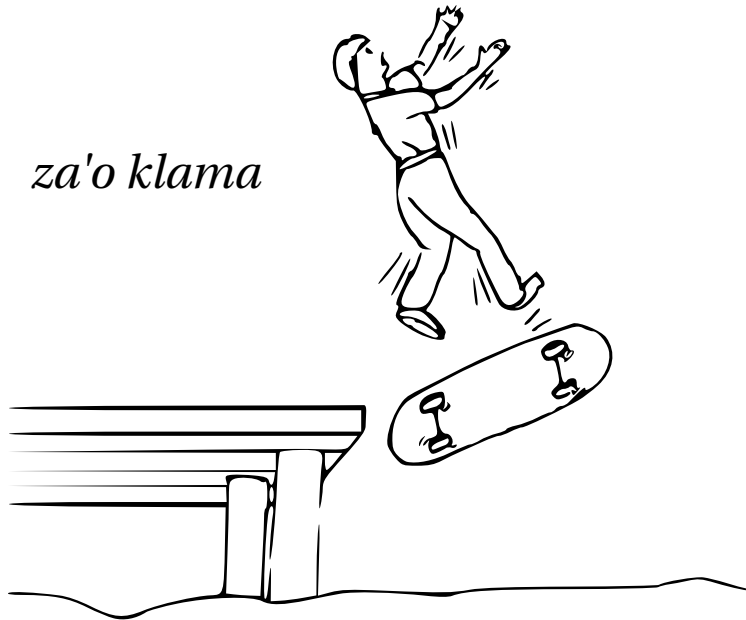
<i>ba'i</i>	basti	replaced by	instead of				
<i>bai</i>	bapli	compelled by	compelling				
<i>bau</i>	bangu	in language	in language of				
<i>be'i</i>	benji	sent by	transmitting	sent to	with transmit origin	trans- mit- ted via	
<i>ca'i</i>	catni	by authority of	with authority over				
<i>cau</i>	claxu	lacked by	without				
<i>ci'e</i>	ciste	in system	with system func- tion	of system compo- nents			
<i>ci'o</i>	cinmo	felt by	feeling emotion				
<i>ci'u</i>	ckilu	on the scale	on scale measur- ing				
<i>cu'u</i>	cusku	as said by	expressing	as told to	expressed in medium		
<i>de'i</i>	detri	dated	on the same date as				
<i>di'o</i>	diklo	at the locus	of at specific locus				
<i>du'i</i>	dunli	as much as	equal to				
<i>du'o</i>	djuno	according to	knowing facts	knowing about	under episte- mology		
<i>fa'e</i>	fatne	reverse of	in reversal of				
<i>fau</i>	fasnu	in the event of					
<i>fi'e</i>	finti	created by	creating work	created for purpose			
<i>ga'a</i>	zgana	to observer	observing	observed by means	observed under condi- tions		
<i>gau</i>	gasnu	with agent	as agent in doing				
<i>ja'e</i>	jolge	resulting in	results because of				
<i>ja'i</i>	javni	by rule	by rule prescribing				
<i>ji'e</i>	jimte	up to limit	as a limit of				
<i>ji'o</i>	jitro	under direction	controlling				
<i>ji'u</i>	jicmu	based on	supporting				
<i>ka'a</i>	klama	gone to by	with destination	with origin	via route	by trans- port mode	

<i>ka'i</i>	krati	represented by	on behalf of		
<i>kai</i>	ckaji	characterizing	with property		
<i>ki'i</i>	ckini	as relation of	related to	with relation	
<i>ki'u</i>	krinu	justified by	with justified result		
<i>koi</i>	korbi	bounded by	as boundary of	bordering	
<i>ku'u</i>	kulnu	in culture	in culture of		
<i>la'u</i>	klani	as quantity	of in quantity		
<i>le'a</i>	klesi	in category	as category of	defined by quality	
<i>li'e</i>	lidne	led by	leading		
<i>ma'e</i>	marji	of material	made from material	in material form of	
<i>ma'i</i>	manri	in reference frame	as a standard for		
<i>mau</i>	zmadu	exceeded by	more than		
<i>me'a</i>	mleca	undercut by	less than		
<i>me'e</i>	cmene	with name	as a name for	as a name to	
<i>mu'i</i>	mukti	motivated by	motive therefore		
<i>mu'u</i>	mupli	exemplified by	as an example of		
<i>ni'i</i>	nibli	entailed by	entails		
<i>pa'a</i>	panra	in addition to	similar to	similar in pattern	similar by standard
<i>pa'u</i>	pagbu	with component	as a part of		
<i>pi'o</i>	pilno	used by	using tool		
<i>po'i</i>	porsi	in the sequence	sequenced by rule		
<i>pu'a</i>	pluka	pleased by	in order to please		
<i>pu'e</i>	pruce	by process	processing from	processing into	passing through stages
<i>ra'a</i>	srana	pertained to by	concerning		
<i>ra'i</i>	krasi	from source	as an origin of		
<i>rai</i>	traji	with superlative	superlative in	at extreme	superlative among
<i>ri'a</i>	rinka	caused by	causing		
<i>ri'i</i>	lifri	experienced by	experiencing		
<i>sau</i>	sarcu	requiring	necessarily for	necessarily under conditions	

<i>si'u</i>	sidju	aided by	assisting in	
<i>ta'i</i>	tadji	by method	as a method for	
<i>tai</i>	tamsmi	as a form of	in form	in form
				similar to
<i>ti'i</i>	stidi	suggested by	suggesting	suggested to
<i>ti'u</i>	tcika	with time	at the time of	
<i>tu'i</i>	stuzi	with site	as location of	
<i>va'o</i>	vanbi	under cond.	as conditions for	
<i>va'u</i>	xamgu	benefiting from	with beneficiary	
<i>zau</i>	zanru	approved by	approving	
<i>zu'e</i>	zunkte	with actor	with means to goal	with goal
<i>do'e</i>		vaguely related to		

# Imaginary Journeys: The Lojban Space/ Time Tense System

*za'o klama*



## 10.1 Introductory

This chapter attempts to document and explain the space/time tense system of Lojban. It does not attempt to answer all questions of the form “How do I say such-and-such (an English tense) in Lojban?” Instead, it explores the Lojban tense system from the inside, attempting to educate the reader into a Lojbanic viewpoint. Once the overall system is understood and the resources that it makes available are familiar, the reader should have some hope of using appropriate tense constructs and being correctly understood.

The system of Lojban tenses presented here may seem really complex because of all the pieces and all the options; indeed, this chapter is the longest one in this book. But tense is in fact complex in every language. In your native language, the subtleties of tense are intuitive.

In foreign languages, you are seldom taught the entire system until you have reached an advanced level. Lojban tenses are extremely systematic and productive, allowing you to express subtleties based on what they mean rather than on how they act similarly to English tenses. This chapter concentrates on presenting an intuitive approach to the meaning of Lojban tense words and how they may be creatively and productively combined.

What is “tense”? Historically, “tense” is the attribute of verbs in English and related languages that expresses the time of the action. In English, three tenses are traditionally recognized, conventionally called the past, the present, and the future. There are also a variety of compound tenses used in English. However, there is no simple relationship between the form of an English tense and the time actually expressed:

**Example 10.1.1**

I go to London tomorrow.  
I will go to London tomorrow.  
I am going to London tomorrow.

all mean the same thing, even though the first sentence uses the present tense; the second, the future tense; and the third, a compound tense usually called *present progressive*. Likewise, a newspaper headline says “JONES DIES”, although it is obvious that the time referred to must be in the past. Tense is a mandatory category of English: every sentence must be marked for tense, even if in a way contrary to logic, because every main verb has a tense marker built into it. By contrast, Lojban brivla have no implicit or explicit tense marker attached to them.

In Lojban, the concept of tense extends to every selbri, not merely the verb-like ones. In addition, tense structures provide information about location in space as well as in time. All tense information is optional in Lojban: a sentence like:

**Example 10.1.2**

mi klama le zarci  
I go-to the market.

can be understood as:

**Example 10.1.3**

I went to the market.  
I am going to the market.  
I have gone to the market.  
I will go to the market.  
I continually go to the market.

as well as many other possibilities: context resolves which is correct.

The placement of a tense construct within a Lojban bridi is easy: right before the selbri. It goes immediately after the “cu”, and can in fact always replace the “cu” (although in very complex sentences the rules for eliding terminators may be changed as a result). In the following examples, “pu” is the tense marker for “past time”:

**Example 10.1.4**

mi cu pu klama le zarci  
mi pu klama le zarci  
I in-the-past go-to the market.  
I went to the market.



It is also possible to put the tense somewhere else in the bridi by adding “ku” after it. This “ku” is an elidable terminator, but it’s almost never possible to actually elide it except at the end of the bridi:

**Example 10.1.5**

puku mi klama le zarci  
In-the-past I go-to the market.  
Earlier, I went to the market.

**Example 10.1.6**

mi klama puku le zarci  
I go-to in-the-past the market.  
I went earlier to the market.

**Example 10.1.7**

mi klama le zarci pu <ku>  
I go-to the market in-the-past.  
I went to the market earlier.

Example 10.1.4 through Example 10.1.7 are different only in emphasis. Abnormal order, such as Example 10.1.5 through Example 10.1.7 exhibit, adds emphasis to the words that have been moved; in this case, the tense cmavo “pu”. Words at either end of the sentence tend to be more noticeable.

## 10.2 Spatial tenses: FAhA and VA

The following cmavo are discussed in this section (the complete list of FAhA cmavo can be found in Section 10.27):

**Definition 10.1**

<i>vi</i>	short distance	VA
<i>va</i>	medium distance	VA
<i>vu</i>	long distance	VA
<i>zu'a</i>	left	FAhA
<i>ri'u</i>	right	FAhA
<i>ga'u</i>	up	FAhA
<i>ni'a</i>	down	FAhA
<i>ca'u</i>	front	FAhA
<i>ne'i</i>	within	FAhA
<i>be'a</i>	north of	FAhA

Why is this section about spatial tenses rather than the more familiar time tenses of Section 10.1, asks the reader? Because the model to be used in explaining both will be easier to grasp for space than for time. The explanation of time tenses will resume in Section 10.4.

English doesn’t have mandatory spatial tenses. Although there are plenty of ways in English of showing where an event happens, there is absolutely no need to do so. Considering this fact may give the reader a feel for what the optional Lojban time tenses are like. From the Lojban point of view, space and time are interchangeable, although they are not treated identically.

Lojban specifies the spatial tense of a bridi (the place at which it occurs) by using words from selma'o FAhA and VA to describe an imaginary journey from the speaker to the place referred to. FAhA cmavo specify the direction taken in the journey, whereas VA cmavo specify the distance gone. For example:

**Example 10.2.1**

le nanmu va batci le gerku  
The man *<medium distance>* bites the dog.  
Over there the man is biting the dog.

What is at a medium distance? The event referred to by the bridi: the man biting the dog. What is this event at a medium distance from? The speaker's location. We can understand the "va" as saying: "If you want to get from the speaker's location to the location of the bridi, journey for a medium distance (in some direction unspecified)." This "imaginary journey" can be used to understand not only Example 10.2.1, but also every other spatial tense construct.

Suppose you specify a direction with a FAhA cmavo, rather than a distance with a VA cmavo:

**Example 10.2.2**

le nanmu zu'a batci le gerku  
The man *<left>* bites the dog.

Here the imaginary journey is again from the speaker's location to the location of the bridi, but it is now performed by going to the left (in the speaker's reference frame) for an unspecified distance. So a reasonable translation is "To my left, the man bites the dog". The "my" does not have an explicit equivalent in the Lojban, because the speaker's location is understood as the starting point.

(Etymologically, by the way, "zu'a" is derived from "zunle", the gismu for "left", whereas "vi", "va", and "vu" are intended to be reminiscent of "ti", "ta", and "tu", the demonstrative pronouns "this-here", "that-there", and "that-yonder".)

What about specifying both a direction and a distance? The rule here is that the direction must come before the distance:

**Example 10.2.3**

le nanmu zu'avi batci le gerku  
The man *<left>* *<short distance>* bites the dog.  
Slightly to my left, the man bites the dog.

As explained in Section 10.1, it would be perfectly correct to use "ku" to move this tense to the beginning or the end of the sentence to emphasize it:

**Example 10.2.4**

zu'aviku le nanmu cu batci le gerku  
*<Left>* *<short distance>* the man bites the dog.  
Slightly to my left, the man bites the dog.

## 10.3 Compound spatial tenses

Humph, says the reader: this talk of "imaginary journeys" is all very well, but what's the point of it? — "zu'a" means "on the left" and "vi" means "nearby", and there's no more to be said.

The imaginary-journey model becomes more useful when so-called *compound tenses* are involved. A compound tense is exactly like a simple tense, but has several FAhAs run together:

**Example 10.3.1**

le nanmu ga'u zu'a batci le gerku  
The man ⟨*up*⟩ ⟨*left*⟩ bites the dog.

The proper interpretation of Example 10.3.1 is that the imaginary journey has two stages: first move from the speaker's location upward, and then to the left. A translation might read "Left of a place above me, the man bites the dog". (Perhaps the speaker is at the bottom of a manhole, and the dog-biting is going on at the edge of the street.)

In the English translation, the keywords "left" and "above" occur in reverse order to the Lojban order. This effect is typical of what happens when we "unfold" Lojban compound tenses into their English equivalents, and shows why it is not very useful to try to memorize a list of Lojban tense constructs and their colloquial English equivalents.

The opposite order also makes sense:

**Example 10.3.2**

le nanmu zu'a ga'u batci le gerku  
The man ⟨*left*⟩ ⟨*up*⟩ bites the dog.  
Above a place to the left of me, the man bites the dog.

In ordinary space, the result of going up and then to the left is the same as that of going left and then up, but such a simple relationship does not apply in all environments or to all directions: going south, then east, then north may return one to the starting point, if that point is the North Pole.

Each direction can have a distance following:

**Example 10.3.3**

le nanmu zu'avi ga'uvu batci le gerku  
The man ⟨*left*⟩ ⟨*short distance*⟩ ⟨*up*⟩ ⟨*long distance*⟩ bites the dog.  
Far above a place slightly to the left of me, the man bites the dog.

A distance can also come at the beginning of the tense construct, without any specified direction. (Example 10.2.1, with VA alone, is really a special case of this rule when no directions at all follow.)

**Example 10.3.4**

le nanmu vi zu'a batci le gerku  
The man ⟨*short distance*⟩ ⟨*left*⟩ bites the dog.  
Left of a place near me, the man bites the dog.

Any number of directions may be used in a compound tense, with or without specified distances for each:

**Example 10.3.5**

le nanmu ca'uvi ni'ava ri'uvu ne'i batci le gerku  
The man ⟨*front*⟩ ⟨*short*⟩ ⟨*down*⟩ ⟨*medium*⟩ ⟨*right*⟩ ⟨*long*⟩ ⟨*within*⟩ bites the dog.  
Within a place a long distance to the right of a place which is a medium distance downward from a place a short distance in front of me, the man bites the dog.

Whew! It's a good thing tense constructs are optional: having to say all that could certainly be painful. Note, however, how much shorter the Lojban version of Example 10.3.5 is than the English version.

## 10.4 Temporal tenses: PU and ZI

The following cmavo are discussed in this section:

Definition 10.2		
<i>pu</i>	past	<i>PU</i>
<i>ca</i>	present	<i>PU</i>
<i>ba</i>	future	<i>PU</i>
<i>zi</i>	short time distance	<i>ZI</i>
<i>za</i>	medium time distance	<i>ZI</i>
<i>zu</i>	long time distance	<i>ZI</i>

Now that the reader understands spatial tenses, there are only two main facts to understand about temporal tenses: they work exactly like the spatial tenses, with selma'o PU and ZI standing in for FAhA and VA; and when both spatial and temporal tense cmavo are given in a single tense construct, the temporal tense is expressed first. (If space were expressed before time, then certain constructions would be ambiguous.)

### Example 10.4.1

le nanmu pu batci le gerku  
 The man (*past*) bites the dog.  
 The man bit the dog.

means that to reach the dog-biting, you must take an imaginary journey through time, moving towards the past an unspecified distance. (Of course, this journey is even more imaginary than the ones talked about in the previous sections, since time-travel is not an available option.)

Lojban recognizes three temporal directions: “pu” for the past, “ca” for the present, and “ba” for the future. (Etymologically, these derive from the corresponding gismu “purci”, “cabna”, and “balvi”. See Section 10.23 for an explanation of the exact relationship between the cmavo and the gismu.) There are many more spatial directions, since there are FAhA cmavo for both absolute and relative directions as well as “direction-like relationships” like “surrounding”, “within”, “touching”, etc. (See Section 10.27 for a complete list.) But there are really only two directions in time: forward and backward, toward the future and toward the past. Why, then, are there three cmavo of selma'o PU?

The reason is that tense is subjective: human beings perceive space and time in a way that does not necessarily agree with objective measurements. We have a sense of “now” which includes part of the objective past and part of the objective future, and so we naturally segment the time line into three parts. The Lojban design recognizes this human reality by providing a separate time-direction cmavo for the “zero direction”, Similarly, there is a FAhA cmavo for the zero space direction: “bu'u”, which means something like “coinciding”.

(Technical note for readers conversant with relativity theory: The Lojban time tenses reflect time as seen by the speaker, who is assumed to be a “point-like observer” in the relativistic sense: they do not say anything about physical relationships of relativistic interval, still less about implicit causality. The nature of tense is not only subjective but also observer-based.)

Here are some examples of temporal tenses:

**Example 10.4.2**

le nanmu puzi batci le gerku  
 The man ⟨*past*⟩ ⟨*short distance*⟩ bites the dog.  
 A short time ago, the man bit the dog.

**Example 10.4.3**

le nanmu pu pu batci le gerku  
 The man ⟨*past*⟩ ⟨*past*⟩ bites the dog.  
 Earlier than an earlier time than now, the man bit the dog.  
 The man had bitten the dog.  
 The man had been biting the dog.

**Example 10.4.4**

le nanmu ba puzi batci le gerku  
 The man ⟨*future*⟩ ⟨*past*⟩ ⟨*short*⟩ bites the dog.  
 Shortly earlier than some time later than now, the man will bite the dog.  
 Soon before then, the man will have bitten the dog.  
 The man will have just bitten the dog.  
 The man will just have been biting the dog.

What about the analogue of an initial VA without a direction? Lojban does allow an initial ZI with or without following PUs:

**Example 10.4.5**

le nanmu zi pu batci le gerku  
 The man ⟨*short*⟩ ⟨*past*⟩ bites the dog.  
 Before a short time from or before now, the man bit or will bite the dog.

**Example 10.4.6**

le nanmu zu batci le gerku  
 The man ⟨*long*⟩ bites the dog.  
 A long time from or before now, the man will bite or bit the dog.

Example 10.4.5 and Example 10.4.6 are perfectly legitimate, but may not be very much used: “zi” by itself signals an event that happens at a time close to the present, but without saying whether it is in the past or the future. A rough translation might be “about now, but not exactly now”.

Because we can move in any direction in space, we are comfortable with the idea of events happening in an unspecified space direction (“nearby” or “far away”), but we live only from past to future, and the idea of an event which happens “nearby in time” is a peculiar one. Lojban provides lots of such possibilities that don’t seem all that useful to English-speakers, even though you can put them together productively; this fact may be a limitation of English.

Finally, here are examples which combine temporal and spatial tense:

**Example 10.4.7**

le nanmu puzu vu batci le gerku  
 The man *<past>* *<long time>* *<long space>* bites the dog.  
 Long ago and far away, the man bit the dog.

**Example 10.4.8**

le nanmu batci le gerku puzuvuku  
 The man bites the dog *<past>* *<long time>* *<long space>*.  
 The man bit the dog long ago and far away.

## 10.5 Interval sizes: VEhA and ZEhA

The following cmavo are discussed in this section:

**Definition 10.3**

<i>ve'i</i>	short space interval	<i>VEhA</i>
<i>ve'a</i>	medium space interval	<i>VEhA</i>
<i>ve'u</i>	long space interval	<i>VEhA</i>
<i>ze'i</i>	short time interval	<i>ZEhA</i>
<i>ze'a</i>	medium time interval	<i>ZEhA</i>
<i>ze'u</i>	long time interval	<i>ZEhA</i>

So far, we have considered only events that are usually thought of as happening at a particular point in space and time: a man biting a dog at a specified place and time. But Lojbanic events may be much more “spread out” than that: “mi vasxu” (I breathe) is something which is true during the whole of my life from birth to death, and over the entire part of the earth where I spend my life. The cmavo of VEhA (for space) and ZEhA (for time) can be added to any of the tense constructs we have already studied to specify the size of the space or length of the time over which the bridi is claimed to be true.

**Example 10.5.1**

le verba ve'i cadzu le bisli  
 The child *<small space interval>* walks-on the ice.  
 In a small space, the child walks on the ice.  
 The child walks about a small area of the ice.

means that her walking was done in a small area. Like the distances, the interval sizes are classified only roughly as “small, medium, large”, and are relative to the context: a small part of a room might be a large part of a table in that room.

Here is an example using a time interval:

**Example 10.5.2**

le verba ze'a cadzu le bisli  
 The child *<medium time interval>* walks-on the ice.  
 For a medium time, the child walks/walked/will walk  
 on the ice.

Note that with no time direction word, Example 10.5.2 does not say when the walking happened: that would be determined by context. It is possible to specify both directions or distances and an interval, in which case the interval always comes afterward:

**Example 10.5.3**

le verba pu ze'a cadzu le bisli  
 The child *<past>* *<medium time interval>* walks-on the ice.  
 For a medium time, the child walked on the ice.  
 The child walked on the ice for a while.

In Example 10.5.3, the relationship of the interval to the specified point in time or space is indeterminate. Does the interval start at the point, end at the point, or is it centered on the point? By adding an additional direction *cmavo* after the interval, this question can be conclusively answered:

**Example 10.5.4**

mi ca ze'ica cusku dei  
 I *<present>* *<short time interval — present>* express this-utterance.  
 I am now saying this sentence.

means that for an interval starting a short time in the past and extending to a short time in the future, I am expressing the utterance which is Example 10.5.4. Of course, “short” is relative, as always in tenses. Even a long sentence takes up only a short part of a whole day; in a geological context, the era of *Homo sapiens* would only be a “ze'i” interval. By contrast,

**Example 10.5.5**

mi ca ze'ipu cusku dei  
 I *<present>* *<short time interval — past>* express this-utterance.  
 I have just been saying this sentence.

means that for a short time interval extending from the past to the present I have been expressing Example 10.5.5. Here the imaginary journey starts at the present, lays down one end point of the interval, moves into the past, and lays down the other endpoint. Another example:

**Example 10.5.6**

mi pu ze'aba citka le mi sanmi  
 I *<past>* *<medium time interval - future>* eat my meal.  
 For a medium time afterward, I ate my meal.  
 I ate my meal for a while.

With “ca” instead of “ba”, Example 10.5.6 becomes Example 10.5.7,

**Example 10.5.7**

mi pu ze'aca citka le mi sanmi  
 I *<past>* *<medium time interval - present>* eat my meal  
 For a medium time before and afterward, I ate my meal.  
 I ate my meal for a while.

because the interval would then be centered on the past moment rather than oriented toward the future of that moment. The colloquial English translations are the same — English is not well-suited to representing this distinction.

Here are some examples of the use of space intervals with and without specified directions:

**Example 10.5.8**

ta ri'u ve'i finpe  
that-there *<right>* *<short space interval>* is-a-fish  
That thing on my right is a fish.

In Example 10.5.8, there is no equivalent in the colloquial English translation of the “small interval” which the fish occupies. Neither the Lojban nor the English expresses the orientation of the fish. Compare Example 10.5.9:

**Example 10.5.9**

ta ri'u ve'ica'u finpe  
that-there *<right>* *<short space interval - front>* is-a-fish  
That thing on my right extending forwards is a fish.

Here the space interval occupied by the fish extends from a point on my right to another point in front of the first point.

## 10.6 Vague intervals and non-specific tenses

What is the significance of failing to specify an interval size of the type discussed in Section 10.5? The Lojban rule is that if no interval size is given, the size of the space or time interval is left vague by the speaker. For example:

**Example 10.6.1**

mi pu klama le zarci  
I *<past>* go-to the market.

really means “At a moment in the past, and possibly other moments as well, the event “I went to the market” was in progress”. The vague or unspecified interval contains an instant in the speaker’s past. However, there is no indication whether or not the whole interval is in the speaker’s past! It is entirely possible that the interval during which the going-to-the-market is happening stretches into the speaker’s present or even future.

Example 10.6.1 points up a fundamental difference between Lojban tenses and English tenses. An English past-tense sentence like “I went to the market” generally signifies that the going-to-the-market is entirely in the past; that is, that the event is complete at the time of speaking. Lojban “pu” has no such implication.

This property of a past tense is sometimes called *aorist*, in reference to a similar concept in the tense system of Classical Greek. All of the Lojban tenses have the same property, however:

**Example 10.6.2**

le tricu ba crino  
the tree *<future>* is-green  
The tree will be green.

does not imply (as the colloquial English translation does) that the tree is not green now. The vague interval throughout which the tree is, in fact, green may have already started. This general principle does not mean that Lojban has no way of indicating that a tree will be green but



is not yet green. Indeed, there are several ways of expressing that concept: see Section 10.10 (event contours) and Section 10.20 (logical connection between tenses).

## 10.7 Dimensionality: VIhA

The following cmavo are discussed in this section:

### Definition 10.4

<i>vi'i</i>	on a line	<i>VIhA</i>
<i>vi'a</i>	in an area	<i>VIhA</i>
<i>vi'u</i>	through a volume	<i>VIhA</i>
<i>vi'e</i>	throughout a space/time interval	<i>VIhA</i>

The cmavo of ZEhA are sufficient to express time intervals. One fundamental difference between space and time, however, is that space is multi-dimensional. Sometimes we want to say not only that something moves over a small interval, but also perhaps that it moves in a line. Lojban allows for this. I can specify that a motion “in a small space” is more specifically “in a short line”, “in a small area”, or “through a small volume”.

What about the child walking on the ice in Example 10.5.1 through Example 10.5.3? Given the nature of ice, probably the area interpretation is most sensible. I can make this assumption explicit with the appropriate member of selma'o VIhA:

### Example 10.7.1

le verba ve'a vi'a cadzu le bisli  
 The child ⟨*medium space interval*⟩ ⟨*2-dimensional*⟩ walks-on the ice.  
 In a medium-sized area, the child walks on the ice.

Space intervals can contain either VEhA or VIhA or both, but if both, VEhA must come first, as Example 10.7.1 shows.

The reader may wish to raise a philosophical point here. (Readers who don't wish to, should skip this paragraph.) The ice may be two-dimensional, or more accurately its surface may be, but since the child is three-dimensional, her walking must also be. The subjective nature of Lojban tense comes to the rescue here: the action is essentially planar, and the third dimension of height is simply irrelevant to walking. Even walking on a mountain could be called *vi'a*, because relatively speaking the mountain is associated with an essentially two-dimensional surface. Motion which is not confined to such a surface (e.g., flying, or walking through a three-dimensional network of tunnels, or climbing among mountains rather than on a single mountain) would be properly described with “*vi'u*”. So the cognitive, rather than the physical, dimensionality controls the choice of VIhA cmavo.

VIhA has a member “*vi'e*” which indicates a 4-dimensional interval, one that involves both space and time. This allows the spatial tenses to invade, to some degree, the temporal tenses; it is possible to make statements about space-time considered as an Einsteinian whole. (There are presently no cmavo of FAhA assigned to “pastward” and “futureward” considered as space rather than time directions — they could be added, though, if Lojbanists find space-time expression useful.) If a temporal tense cmavo is used in the same tense construct with a “*vi'e*” interval, the resulting tense may be self-contradictory.

## 10.8 Movement in space: MOhI

The following cmavo is discussed in this section:

### Definition 10.5

*mo'i* movement flag

*MOhI*

All the information carried by the tense constructs so far presented has been presumed to be static: the bridi is occurring somewhere or other in space and time, more or less remote from the speaker. Suppose the truth of the bridi itself depends on the result of a movement, or represents an action being done while the speaker is moving? This too can be represented by the tense system, using the cmavo “mo'i” (of selma'o MOhI) plus a spatial direction and optional distance; the direction now refers to a direction of motion rather than a static direction from the speaker.

### Example 10.8.1

le verba mo'i ri'u cadzu le bisli  
 The child ⟨*movement*⟩ ⟨*right*⟩ walks-on the ice.  
 The child walks toward my right on the ice.

This is quite different from:

### Example 10.8.2

le verba ri'u cadzu le bisli  
 The child ⟨*right*⟩ walks-on the ice.  
 To the right of me, the child walks on the ice.

In either case, however, the reference frame for defining “right” and “left” is the speaker's, not the child's. This can be changed thus:

### Example 10.8.3

le verba mo'i ri'u cadzu le bisli ma'i vo'a  
 The child ⟨*movement*⟩ ⟨*right*⟩ walks on the ice in-reference-frame the- $x_1$ -place.  
 The child walks toward her right on the ice.

Example 10.8.3 is analogous to Example 10.8.1. The cmavo “ma'i” belongs to selma'o BAI (explained in Chapter 9), and allows specifying a reference frame. Both a regular and a “mo'i”-flagged spatial tense can be combined, with the “mo'i” construct coming last:

### Example 10.8.4

le verba zu'avu mo'i ri'uvi cadzu le bisli  
 The child ⟨*left*⟩ ⟨*long*⟩ ⟨*movement*⟩ ⟨*right*⟩ ⟨*short*⟩ walks-on the ice.  
 Far to the left of me, the child walks a short distance toward my right on the ice.

It is not grammatical to use multiple directions like “zu'a ca'u” after “mo'i”, but complex movements can be expressed in a separate bridi. Here is an example of a movement tense on a bridi not inherently involving movement:

**Example 10.8.5**

mi mo'i ca'uvu citka le mi sanmi  
 I ⟨*movement*⟩ ⟨*front*⟩ ⟨*long*⟩ eat my meal.  
 While moving a long way forward, I eat my meal.

(Perhaps I am eating in an airplane.) There is no parallel facility in Lojban at present for expressing movement in time — time travel — but one could be added easily if it ever becomes useful.

## 10.9 Interval properties: TAhE and “roi”

The following cmavo are discussed in this section:

**Definition 10.6**

<i>di'i</i>	regularly	TAhE
<i>na'o</i>	typically	TAhE
<i>ru'i</i>	continuously	TAhE
<i>ta'e</i>	habitually	TAhE
<i>di'inai</i>	irregularly	TAhE
<i>na'onai</i>	atypically	TAhE
<i>ru'inai</i>	intermittently	TAhE
<i>ta'enai</i>	contrary to habit	TAhE
<i>roi</i>	“n” times	ROI
<i>roinai</i>	other than “n” times	ROI
<i>ze'e</i>	whole time interval	ZEHa
<i>ve'e</i>	whole space interval	VEhA

Consider Lojban bridi which express events taking place in time. Whether a very short interval (a point) or a long interval of time is involved, the event may not be spread consistently throughout that interval. Lojban can use the cmavo of selma'o TAhE to express the idea of continuous or non-continuous actions.

**Example 10.9.1**

mi puzu ze'u velckule  
 I ⟨*past*⟩ ⟨*long distance*⟩ ⟨*long interval*⟩ am-a-school-attende (pupil).  
 Long ago I attended school for a long time.

probably does not mean that I attended school continuously throughout the whole of that long-ago interval. Actually, I attended school every day, except for school holidays. More explicitly,

**Example 10.9.2**

mi puzu ze'u di'i velckule  
 I ⟨*past*⟩ ⟨*long distance*⟩ ⟨*long interval*⟩ ⟨*regularly*⟩ am-a-pupil.  
 Long ago I regularly attended school for a long time.

The four TAhE cmavo are differentiated as follows: “ru'i” covers the entirety of the interval, “di'i” covers the parts of the interval which are systematically spaced subintervals; “na'o”

covers part of the interval, but exactly which part is determined by context; “ta’e” covers part of the interval, selected with reference to the behavior of the actor (who often, but not always, appears in the  $x_1$  place of the bridi).

Using TAhE does not require being so specific. Either the time direction or the time interval or both may be omitted (in which case they are vague). For example:

**Example 10.9.3**

mi ba ta’e klama le zarci  
 I *<future>* *<habitually>* go-to the market.  
 I will habitually go to the market.  
 I will make a habit of going to the market.

specifies the future, but the duration of the interval is indefinite. Similarly,

**Example 10.9.4**

mi na’o klama le zarci  
 I *<typically>* go-to the market  
 I typically go/went/will go to the market

illustrates an interval property in isolation. There are no distance or direction cmavo, so the point of time is vague; likewise, there is no interval cmavo, so the length of the interval during which these goings-to-the-market take place is also vague. As always, context will determine these vague values.

“Intermittently” is the polar opposite notion to “continuously”, and is expressed not with its own cmavo, but by adding the negation suffix “-nai” (which belongs to selma’o NAI) to “ru’i”. For example:

**Example 10.9.5**

le verba ru’inai cadzu le bisli  
 The child *<continuously-not>* walks-on the ice.  
 The child intermittently walks on the ice.

As shown in the cmavo table above, all the cmavo of TAhE may be negated with “-nai”; “ru’inai” and “di’inai” are probably the most useful.

An intermittent event can also be specified by counting the number of times during the interval that it takes place. The cmavo “roi” (which belongs to selma’o ROI) can be appended to a number to make a quantified tense. Quantified tenses are common in English, but not so commonly named: they are exemplified by the adverbs “never”, “once”, “twice”, “thrice”, ... “always”, and by the related phrases “many times”, “a few times”, “too many times”, and so on. All of these are handled in Lojban by a number plus “-roi”:

**Example 10.9.6**

mi paroi klama le zarci  
 I *<one time>* go-to the market.  
 I go to the market once.

**Example 10.9.7**

mi du’eroi klama le zarci  
 I *<too-many times>* go-to the market.  
 I go to the market too often.

With the quantified tense alone, we don't know whether the past, the present, or the future is intended, but of course the quantified tense need not stand alone:

**Example 10.9.8**

mi pu reroi klama le zarci  
 I ⟨*past*⟩ ⟨*two times*⟩ go-to the market.  
 I went to the market twice.

The English is slightly over-specific here: it entails that both goings-to- the-market were in the past, which may or may not be true in the Lojban sentence, since the implied interval is vague. Therefore, the interval may start in the past but extend into the present or even the future.

Adding “-nai” to “roi” is also permitted, and has the meaning “other than (the number specified)”:

**Example 10.9.9**

le ratcu reroi nai citka le cirli  
 The rat ⟨*twice-not*⟩ eats the cheese.  
 The rat eats the cheese other than twice

This may mean that the rat eats the cheese fewer times, or more times, or not at all.

It is necessary to be careful with sentences like Example 10.9.6 and Example 10.9.8, where a quantified tense appears without an interval. What Example 10.9.8 really says is that during an interval of unspecified size, at least part of which was set in the past, the event of my going to the market happened twice. The example says nothing about what happened outside that vague time interval. This is often less than we mean. If we want to nail down that I went to the market once and only once, we can use the cmavo “ze'e” which represents the “whole time interval”: conceptually, an interval which stretches from time's beginning to its end:

**Example 10.9.10**

mi ze'e paroi klama le zarci  
 I ⟨*whole interval*⟩ ⟨*once*⟩ go-to the market.

Since specifying no ZEhA leaves the interval vague, Example 10.9.8 might in appropriate context mean the same as Example 10.9.10 after all — but Example 10.9.10 allows us to be specific when specificity is necessary.

A PU cmavo following “ze'e” has a slightly different meaning from one that follows another ZEhA cmavo. The compound cmavo “ze'epu” signifies the interval stretching from the infinite past to the reference point (wherever the imaginary journey has taken you); “ze'eba” is the interval stretching from the reference point to the infinite future. The remaining form, “ze'eca”, makes specific the “whole of time” interpretation just given. These compound forms make it possible to assert that something has never happened without asserting that it never will.

**Example 10.9.11**

mi ze'epu noroi klama le zarci  
 I ⟨*whole interval*⟩ ⟨*past*⟩ ⟨*never*⟩ go-to the market.  
 I have never gone to the market.

says nothing about whether I might go in future.

The space equivalent of “ze'e” is “ve'e”, and it can be used in the same way with a quantified space tense: see Section 10.11 for an explanation of space interval modifiers.

## 10.10 Event contours: ZAhO and “re’u”

The following cmavo are discussed in this section:

### Definition 10.7

<i>pu’o</i>	inchoative	ZAhO
<i>ca’o</i>	continuative	ZAhO
<i>ba’o</i>	perfective	ZAhO
<i>co’a</i>	initiative	ZAhO
<i>co’u</i>	cessitive	ZAhO
<i>mo’u</i>	completitive	ZAhO
<i>za’o</i>	superfective	ZAhO
<i>co’i</i>	achievative	ZAhO
<i>de’a</i>	pausative	ZAhO
<i>di’a</i>	resumptive	ZAhO
<i>re’u</i>	ordinal tense	ROI

The cmavo of selma’o ZAhO express the Lojban version of what is traditionally called *aspect*. This is not a notion well expressed by English tenses, but many languages (including Chinese and Russian among Lojban’s six source languages) consider it more important than the specification of mere position in time.

The “event contours” of selma’o ZAhO, with their bizarre keywords, represent the natural portions of an event considered as a process, an occurrence with an internal structure including a beginning, a middle, and an end. Since the keywords are scarcely self-explanatory, each ZAhO will be explained in detail here. Note that from the viewpoint of Lojban syntax, ZAhOs are interval modifiers like TAhEs or ROI compounds; if both are found in a single tense, the TAhE/ROI comes first and the ZAhO afterward. The imaginary journey described by other tense cmavo moves us to the portion of the event-as-process which the ZAhO specifies.

It is important to understand that ZAhO cmavo, unlike the other tense cmavo, specify characteristic portions of the event, and are seen from an essentially timeless perspective. The “beginning” of an event is the same whether the event is in the speaker’s present, past, or future. It is especially important not to confuse the speaker-relative viewpoint of the PU tenses with the event-relative viewpoint of the ZAhO tenses.

The cmavo “pu’o”, “ca’o”, and “ba’o” (etymologically derived from the PU cmavo) refer to an event that has not yet begun, that is in progress, or that has ended, respectively:

#### Example 10.10.1

mi pu’o damba  
I ⟨*inchoative*⟩ fight.  
I’m on the verge of fighting.

#### Example 10.10.2

la stiv. ca’o bacru  
Steve ⟨*continuative*⟩ utters.  
Steve continues to talk.

#### Example 10.10.3

le verba ba’o cadzu le bisli

The child *<perfective>* walks-on the ice.  
The child is finished walking on the ice.

As discussed in Section 10.6, the simple PU cmavo make no assumptions about whether the scope of a past, present, or future event extends into one of the other tenses as well. Example 10.10.1 through Example 10.10.3 illustrate that these ZAhO cmavo do make such assumptions possible: the event in 10.1 has not yet begun, definitively; likewise, the event in 10.3 is definitively over.

Note that in Example 10.10.1 and Example 10.10.3, “pu’o” and “ba’o” may appear to be reversed: “pu’o”, although etymologically connected with “pu”, is referring to a future event; whereas “ba’o”, connected with “ba”, is referring to a past event. This is the natural result of the event-centered view of ZAhO cmavo. The inchoative, or “pu’o”, part of an event, is in the “pastward” portion of that event, when seen from the perspective of the event itself. It is only by inference that we suppose that Example 10.10.1 refers to the speaker’s future: in fact, no PU tense is given, so the inchoative part of the event need not be coincident with the speaker’s present: “pu’o” is not necessarily, though in fact often is, the same as “ca pu’o”.

The cmavo in Example 10.10.1 through Example 10.10.3 refer to spans of time. There are also two points of time that can be usefully associated with an event: the beginning, marked by “co’a”, and the end, marked by “co’u”. Specifically, “co’a” marks the boundary between the “pu’o” and “ca’o” parts of an event, and “co’u” marks the boundary between the “ca’o” and “ba’o” parts:

**Example 10.10.4**

mi ba co’a citka le mi sanmi  
I *<future>* *<initiative>* eat my meal.  
I will begin to eat my meal.

**Example 10.10.5**

mi pu co’u citka le mi sanmi  
I *<past>* *<cessitive>* eat my meal.  
I ceased eating my meal.

Compare Example 10.10.4 with:

**Example 10.10.6**

mi ba di’i co’a bajra  
I *<future>* *<regularly>* *<initiative>* run.  
I will regularly begin to run.

which illustrates the combination of a TAHe with a ZAhO.

A process can have two end points, one reflecting the “natural end” (when the process is complete) and the other reflecting the “actual stopping point” (whether complete or not). Example 10.10.5 may be contrasted with:

**Example 10.10.7**

mi pu mo’u citka le mi sanmi  
I *<past>* *<completitive>* eat my meal.  
I finished eating my meal.

In Example 10.10.7, the meal has reached its natural end; in Example 10.10.5, the meal has merely ceased, without necessarily reaching its natural end.

A process such as eating a meal does not necessarily proceed uninterrupted. If it is interrupted, there are two more relevant point events: the point just before the interruption, marked by “de’a”, and the point just after the interruption, marked by “di’a”. Some examples:

**Example 10.10.8**

mi pu de’a citka le mi sanmi  
 I ⟨*past*⟩ ⟨*pausative*⟩ eat my meal.  
 I stopped eating my meal (with the intention of resuming).

**Example 10.10.9**

mi ba di’a citka le mi sanmi  
 I ⟨*future*⟩ ⟨*resumptive*⟩ eat my meal.  
 I will resume eating my meal.

In addition, it is possible for a process to continue beyond its natural end. The span of time between the natural and the actual end points is represented by “za’o”:

**Example 10.10.10**

le xirma ca za’o jivna bajra  
 The horse ⟨*present*⟩ ⟨*superfective*⟩ compete-type-of runs.  
 The horse keeps on running a race too long.

which means that it ran past the finish line (after the race was over — in most races, the runners do not stop right at the finish line).

An entire event can be treated as a single moment using the cmavo “co’i”:

**Example 10.10.11**

la djan. pu co’i catra la djim  
 John ⟨*past*⟩ ⟨*achievative*⟩ kills Jim.  
 John was at the point in time where he killed Jim.

Finally, since an activity is cyclical, an individual cycle can be referred to using a number followed by “re’u”, which is the other cmavo of selma’o ROI:

**Example 10.10.12**

mi pare’u klama le zarci  
 I ⟨*first time*⟩ go-to the store.  
 I go to the store for the first time (within a vague interval).

Note the difference between the following examples:

**Example 10.10.13**

mi pare’u paroi klama le zarci  
 I ⟨*first time*⟩ ⟨*one time*⟩ go-to the store.  
 For the first time, I go to the store once.



**Example 10.10.14**

mi paroi pare'u klama le zarci  
 I *<one time>* *<first time>* go-to the store.  
 There is one occasion on which I go to the store for the first time.

**10.11 Space interval modifiers: FEhE**

The following cmavo is discussed in this section:

**Definition 10.8**

*fe'e*      space interval modifier flag      *FEhE*

Like time intervals, space intervals can also be continuous, discontinuous, or repetitive. Rather than having a whole separate set of selma'o for space interval properties, we instead prefix the flag “fe'e” to the cmavo used for time interval properties. A space interval property would be placed just after the space interval size and/or dimensionality cmavo:

**Example 10.11.1**

ko vi'i fe'e di'i sombo le gurni  
 You-imperative *<1-dimensional>* *<space:>* *<regularly>* sow the grain.  
 Sow the grain in a line and evenly!

**Example 10.11.2**

mi fe'e ciroi tervecnu lo selsalta  
 I *<space:>* *<three places>* buy those-which-are salad-ingredients.  
 I buy salad ingredients in three locations.

**Example 10.11.3**

ze'e roroi ve'e fe'e roroi ku li re su'i re du li vo  
*<whole time>* *<all times>* *<whole space>* *<space:>* *<all places>* The-number 2+2 = the-number  
 4.  
 Always and everywhere, two plus two is four.

As shown in Example 10.11.3, when a tense comes first in a bridi, rather than in its normal position before the selbri (in this case “du”), it is emphasized.

The “fe'e” marker can also be used for the same purpose before members of ZAhO. (The cmavo “be'a” belongs to selma'o FAhA; it is the space direction meaning “north of”.)

**Example 10.11.4**

tu ve'abe'a fe'e co'a rokci  
 that-yonder *<medium space interval - north>* *<space>* *<initiative>* is-a-rock.  
 That is the beginning of a rock extending to my north.  
 That is the south face of a rock.

Here the notion of a “beginning point” represented by the cmavo “co'a” is transferred from “beginning in time” to “beginning in space” under the influence of the “fe'e” flag. Space is not inherently oriented, unlike time, which flows from past to future: therefore, some indication

of orientation is necessary, and the “ve’abe’a” provides an orientation in which the south face is the “beginning” and the north face is the “end”, since the rock extends from south (near me) to north (away from me).

Many natural languages represent time by a space-based metaphor: in English, what is past is said to be “behind us”. In other languages, the metaphor is reversed. Here, Lojban is representing space (or space interval modifiers) by a time-based metaphor: the choice of a FAhA cmavo following a VEhA cmavo indicates which direction is mapped onto the future. (The choice of future rather than past is arbitrary, but convenient for English-speakers.)

If both a TAhE (or ROI) and a ZAhO are present as space interval modifiers, the “fe’e” flag must be prefixed to each.

## 10.12 Tenses as sumti tcita

So far, we have seen tenses only just before the selbri, or (equivalently in meaning) floating about the bridi with “ku”. There is another major use for tenses in Lojban: as sumti tcita, or argument tags. A tense may be used to add spatial or temporal information to a bridi as, in effect, an additional place:

### Example 10.12.1

mi klama le zarci ca le nu do klama le zdani  
 I go-to the market *<present>* the event-of you go-to the house.  
 I go to the market when you go to the house.

Here “ca” does not appear before the selbri, nor with “ku”; instead, it governs the following sumti, the “le nu” construct. What Example 10.12.1 asserts is that the action of the main bridi is happening at the same time as the event mentioned by that sumti. So “ca”, which means “now” when used with a selbri, means “simultaneously-with” when used with a sumti. Consider another example:

### Example 10.12.2

mi klama le zarci pu le nu do pu klama le zdani  
 I go-to the market *<past>* the event-of you *<past>* go-to the house.

The second “pu” is simply the past tense marker for the event of your going to the house, and says that this event is in the speaker’s past. How are we to understand the first “pu”, the sumti tcita?

All of our imaginary journeys so far have started at the speaker’s location in space and time. Now we are specifying an imaginary journey that starts at a different location, namely at the event of your going to the house. Example 10.12.2 then says that my going to the market is in the past, relative not to the speaker’s present moment, but instead relative to the moment when you went to the house. Example 10.12.2 can therefore be translated:

I had gone to the market before you went to the house. (Other translations are possible, depending on the ever-present context.) Spatial direction and distance sumti tcita are exactly analogous:

### Example 10.12.3

le ratcu cu citka le cirla vi le panku  
 The rat eats the cheese *<short distance>* the park.  
 The rat eats the cheese near the park.

**Example 10.12.4**

le ratcu cu citka le cirla vi le vu panku  
 The rat eats the cheese *<short distance>* the *<long distance>* park  
 The rat eats the cheese near the faraway park.

**Example 10.12.5**

le ratcu cu citka le cirla vu le vi panku  
 The rat eats the cheese *<long distance>* the *<short distance>* park  
 The rat eats the cheese far away from the nearby park.

The event contours of selma'o ZAhO (and their space equivalents, prefixed with "fe'e") are also useful as sumti tcita. The interpretation of ZAhO tcita differs from that of FAhA, VA, PU, and ZI tcita, however. The event described in the sumti is viewed as a process, and the action of the main bridi occurs at the phase of the process which the ZAhO specifies, or at least some part of that phase. The action of the main bridi itself is seen as a point event, so that there is no issue about which phase of the main bridi is intended. For example:

**Example 10.12.6**

mi morsi ba'o le nu mi jmive  
 I am-dead *<perfective>* the event-of I live.  
 I die in the aftermath of my living.

Here the (point-)event of my being dead is the portion of my living-process which occurs after the process is complete. Contrast Example 10.12.6 with:

**Example 10.12.7**

mi morsi ba le nu mi jmive  
 I am-dead *<future>* the event-of I live.

As explained in Section 10.6, Example 10.12.7 does not exclude the possibility that I died before I ceased to live!

Likewise, we might say:

**Example 10.12.8**

mi klama le zarci pu'o le nu mi citka  
 I go-to the store *<inchoative>* the event-of I eat

which indicates that before my eating begins, I go to the store, whereas

**Example 10.12.9**

mi klama le zarci ba'o le nu mi citka  
 I go-to the store *<perfective>* the event-of I eat

would indicate that I go to the store after I am finished eating.

Here is an example which mixes temporal ZAhO (as a tense) and spatial ZAhO (as a sumti tcita):

**Example 10.12.10**

le bloti pu za'o xelklama fe'e ba'o le lalxu  
 the boat ⟨*past*⟩ ⟨*superfective*⟩ is-a-transport-mechanism ⟨*space*⟩ ⟨*perfective*⟩ the lake.  
 The boat sailed for too long and beyond the lake.

Probably it sailed up onto the dock. One point of clarification: although “xelklama” appears to mean simply “is-a-mode-of-transport”, it does not — the *bridi* of Example 10.12.10 has four omitted arguments, and thus has the (physical) journey which goes on too long as part of its meaning.

The remaining tense *cmavo*, which have to do with interval size, dimension, and continuousness (or lack thereof) are interpreted to let the *sumti* specify the particular interval over which the main *bridi* operates:

**Example 10.12.11**

mi klama le zarci reroi le ca djedi  
 I go-to the market ⟨*twice*⟩ the ⟨*present*⟩ day  
 I go/went/will go to the market twice today.

Be careful not to confuse a tense used as a *sumti tcita* with a tense used within a *selctita sumti*:

**Example 10.12.12**

loi snime cu carvi ze'u le ca dunra  
 some-of-the-mass-of snow rains ⟨*long time interval*⟩ the ⟨*present*⟩ winter.  
 Snow falls during this winter.

claims that the interval specified by “this winter” is long, as events of snowfall go, whereas

**Example 10.12.13**

loi snime cu carvi ca le ze'u dunra  
 some-of-the-mass-of snow rains ⟨*present*⟩ the ⟨*long time*⟩ winter.  
 Snow falls in the long winter.

claims that during some part of the winter, which is long as winters go, snow falls.

## 10.13 Sticky and multiple tenses: KI

The following *cmavo* is discussed in this section:

**Definition 10.9**

*ki* sticky tense set/reset

*KI*

So far we have only considered tenses in isolated *bridi*. Lojban provides several ways for a tense to continue in effect over more than a single *bridi*. This property is known as “stickiness”: the tense gets “stuck” and remains in effect until explicitly “unstuck”. In the metaphor of the imaginary journey, the place and time set by a sticky tense may be thought of as a campsite or way-station: it provides a permanent origin with respect to which other tenses are understood. Later imaginary journeys start from that point rather than from the speaker.

To make a tense sticky, suffix “ki” to it:

**Example 10.13.1**

mi puki klama le zarci  
 .i le nanmu cu batci le gerku  
 I ⟨*past*⟩ ⟨*sticky*⟩ go-to the market.  
 The man bites the dog.  
 I went to the market. The man bit the dog.

Here the use of “puki” rather than just “pu” ensures that the tense will affect the next sentence as well. Otherwise, since the second sentence is tenseless, there would be no way of determining its tense; the event of the second sentence might happen before, after, or simultaneously with that of the first sentence.

(The last statement does not apply when the two sentences form part of a narrative. See Section 10.14 for an explanation of “story time”, which employs a different set of conventions.)

What if the second sentence has a tense anyway?

**Example 10.13.2**

mi puki klama le zarci  
 .i le nanmu pu batci le gerku  
 I ⟨*past*⟩ sticky go-to the market.  
 The man ⟨*past*⟩ bites the dog.

Here the second “pu” does not replace the sticky tense, but adds to it, in the sense that the starting point of its imaginary journey is taken to be the previously set sticky time. So the translation of Example 10.13.2 is:

**Example 10.13.3**

I went to the market.  
 The man had earlier bitten the dog.

and it is equivalent in meaning (when considered in isolation from any other sentences) to:

**Example 10.13.4**

mi pu klama le zarci  
 .i le nanmu pupu batci le gerku  
 I ⟨*past*⟩ go-to the market.  
 The man ⟨*past*⟩ ⟨*past*⟩ bites the dog.

The point has not been discussed so far, but it is perfectly grammatical to have more than one tense construct in a sentence:

**Example 10.13.5**

puku mi ba klama le zarci  
 ⟨*past*⟩ I ⟨*future*⟩ go-to the market.  
 Earlier, I was going to go to the market.

Here there are two tenses in the same bridi, the first floating free and specified by “puku”, the second in the usual place and specified by “ba”. They are considered cumulative in the same way as the two tenses in separate sentences of Example 10.13.4. Example 10.13.5 is therefore equivalent in meaning, except for emphasis, to:

**Example 10.13.6**

mi puba klama le zarci  
 I ⟨*past*⟩ ⟨*future*⟩ go-to the market.  
 I was going to go to the market.

Compare Example 10.13.7 and Example 10.13.8, which have a different meaning from Example 10.13.5 and Example 10.13.6:

**Example 10.13.7**

mi ba klama le zarci puku  
 I ⟨*future*⟩ go-to the market ⟨*past*⟩.  
 I will have gone to the market earlier.

**Example 10.13.8**

mi bapu klama le zarci  
 I ⟨*future*⟩ ⟨*past*⟩ go-to the market.  
 I will have gone to the market.

So when multiple tense constructs in a single bridi are involved, order counts — the tenses cannot be shifted around as freely as if there were only one tense to worry about.

But why bother to allow multiple tense constructs at all? They specify separate portions of the imaginary journey, and can be useful in order to make part of a tense sticky. Consider Example 10.13.9, which adds a second bridi and a “ki” to Example 10.13.5:

**Example 10.13.9**

pukiku mi ba klama le zarci  
 .i le nanmu cu batci le gerku ⟨*past*⟩ ⟨*sticky*⟩ I ⟨*future*⟩ go-to the market. The man bites the dog.

What is the implied tense of the second sentence? Not “puba”, but only “pu”, since only “pu” was made sticky with “ki”. So the translation is “I was going to go to the market. The man bit the dog.”

Lojban has several ways of embedding a bridi within another bridi: descriptions, abstractors, relative clauses. (Technically, descriptions contain selbri rather than bridi.) Any of the selbri of these subordinate bridi may have tenses attached. These tenses are interpreted relative to the tense of the main bridi:

**Example 10.13.10**

mi pu klama le ba'o zarci  
 I ⟨*past*⟩ go-to the ⟨*perfective*⟩ market  
 I went to the former market.

The significance of the “ba'o” in Example 10.13.10 is that the speaker's destination is described as being “in the aftermath of being a market”; that is, it is a market no longer. In particular, the time at which it was no longer a market is in the speaker's past, because the “ba'o” is interpreted relative to the “pu” tense of the main bridi.

Here is an example involving an abstraction bridi:

**Example 10.13.11**

mi ca jinvi le du'u mi ba morsi  
 I now opine the fact-that I will-be dead.  
 I now believe that I will be dead.

Here the event of being dead is said to be in the future with respect to the opinion, which is in the present.

“ki” may also be used as a tense by itself. This cancels all stickiness and returns the *bridi* and all following *bridi* to the speaker’s location in both space and time:

**Example 10.13.12**

mi ki cusku dei  
 I *<here and now>* express this-utterance.  
 I say this sentence now.

In complex descriptions, multiple tenses may be saved and then used by adding a subscript to “ki”. A time made sticky with “kixipa” (ki-sub-1) can be returned to by specifying “kixipa” as a tense by itself. In the case of written expression, the writer’s here-and-now is often different from the reader’s, and a pair of subscripted “ki” tenses could be used to distinguish the two.

## 10.14 Story time

Making strict use of the conventions explained in Section 10.13 would be intolerably awkward when a story is being told. The time at which a story is told by the narrator is usually unimportant to the story. What matters is the flow of time within the story itself. The term “story” in this section refers to any series of statements related in more-or-less time-sequential order, not just a fictional one.

Lojban speakers use a different set of conventions, commonly called *story time*, for inferring tense within a story. It is presumed that the event described by each sentence takes place some time more or less after the previous ones. Therefore, tenseless sentences are implicitly tensed as “what happens next”. In particular, any sticky time setting is advanced by each sentence.

The following mini-story illustrates the important features of story time. A sentence-by-sentence explication follows:

**Example 10.14.1**

puzuki ku ne'iki le kevna le ninmu goi ko'a zutse le rokci  
*<past> <long> <sticky> <,> <inside> <sticky>* the cave, the woman defined-as she-1 sat-on the rock  
 Long ago, in a cave, a woman sat on a rock.

**Example 10.14.2**

.i ko'a citka loi kanba rectu  
 She-1 *<tenseless>* eat some-of-the-mass-of goat flesh.  
 She was eating goat’s meat.

**Example 10.14.3**

.i ko'a pu jukpa ri le mudyfagri  
 She *<past>* cook the-last-mentioned by-method the wood-fire.  
 She had cooked the meat over a wood fire.

**Example 10.14.4**

.i lei rectu cu zanglare  
 The-mass-of flesh is-(favorable)-warm.  
 The meat was pleasantly warm.

**Example 10.14.5**

.i le labno goi ko'e bazaki nenri klama le kevna  
 The wolf defined-as it-2 *<future>* *<medium>* *<sticky>* within-came to-the cave.  
 A while later, a wolf came into the cave.

**Example 10.14.6**

.i ko'e lebna lei rectu ko'a  
 It-2 *<tenseless>* takes the-mass-of flesh from-her-1.  
 It took the meat from her.

**Example 10.14.7**

.i ko'e bartu klama  
 It-2 out ran  
 It ran out.

Example 10.14.1 sets both the time (long ago) and the place (in a cave) using “ki”, just like the sentence sequences in Section 10.13. No further space cmavo are used in the rest of the story, so the place is assumed to remain unchanged. The English translation of Example 10.14.1 is marked for past tense also, as the conventions of English storytelling require: consequently, all other English translation sentences are also in the past tense. (We don't notice how strange this is; even stories about the future are written in past tense!) This conventional use of past tense is not used in Lojban narratives.

Example 10.14.2 is tenseless. Outside story time, it would be assumed that its event happens simultaneously with that of Example 10.14.1, since a sticky tense is in effect; the rules of story time, however, imply that the event occurs afterwards, and that the story time has advanced (changing the sticky time set in Example 10.14.1).

Example 10.14.3 has an explicit tense. This is taken relative to the latest setting of the sticky time; therefore, the event of Example 10.14.3 happens before that of Example 10.14.2. It cannot be determined if Example 10.14.3 happens before or after Example 10.14.1.

Example 10.14.4 is again tenseless. Story time was not changed by the flashback in Example 10.14.3, so Example 10.14.4 happens after Example 10.14.2.

Example 10.14.5 specifies the future (relative to Example 10.14.4) and makes it sticky. So all further events happen after Example 10.14.5.

Example 10.14.6 and Example 10.14.7 are again tenseless, and so happen after Example 10.14.5. (Story time is changed.)

So the overall order is Example 10.14.1 — Example 10.14.3 — Example 10.14.2 — Example 10.14.4 — (medium interval) — Example 10.14.5 — Example 10.14.6 — Example 10.14.7. It is also possible that Example 10.14.3 happens before Example 10.14.1.



If no sticky time (or space) is set initially, the story is set at an unspecified time (or space): the effect is like that of choosing an arbitrary reference point and making it sticky. This style is common in stories that are jokes. The same convention may be used if the context specifies the sticky time sufficiently.

## 10.15 Tenses in subordinate bridi

English has a set of rules, formally known as “sequence of tense rules”, for determining what tense should be used in a subordinate clause, depending on the tense used in the main sentence. Here are some examples:

### Example 10.15.1

John says that George is going to the market.

### Example 10.15.2

John says that George went to the market.

### Example 10.15.3

John said that George went to the market.

### Example 10.15.4

John said that George had gone to the market.

In Example 10.15.1 and Example 10.15.2, the tense of the main sentence is the present: “says”. If George goes when John speaks, we get the present tense “is going” (“goes” would be unidiomatic); if George goes before John speaks, we get the past tense “went”. But if the tense of the main sentence is the past, with “said”, then the tense required in the subordinate clause is different. If George goes when John speaks, we get the past tense “went”; if George goes before John speaks, we get the past-perfect tense “had gone”.

The rule of English, therefore, is that both the tense of the main sentence and the tense of the subordinate clause are understood relative to the speaker (not John, but the person who speaks Example 10.15.1 through Example 10.15.4).

Lojban, like Russian and Esperanto, uses a different convention. A tense in a subordinate bridi is understood to be relative to the tense already set in the main bridi. Thus Example 10.15.1 through Example 10.15.4 can be expressed in Lojban respectively thus:

### Example 10.15.5

la djan. ca cusku le se du'u la djordj. ca klama le zarci  
John *<present>* says the statement-that George *<present>* goes-to the market.

### Example 10.15.6

la djan. ca cusku le se du'u la djordj. pu klama le zarci  
John *<present>* says the statement-that George *<past>* goes-to the market.

### Example 10.15.7

la djan. pu cusku le se du'u la djordj. ca klama le zarci  
John *<past>* says the statement-that George *<present>* goes-to the market.

**Example 10.15.8**

la djan. pu cusku le se du'u la djordj. pu klama le zarci  
 John *<past>* says the statement-that George *<past>* goes-to the market.

Probably the most counterintuitive of the Lojban examples is Example 10.15.7. The “ca” looks quite odd, as if George were going to the market right now, rather than back when John spoke. But this “ca” is really a “ca” with respect to a reference point specified by the outer “pu”. This behavior is the same as the additive behavior of multiple tenses in the same bridi, as explained in Section 10.13.

There is a special cmavo “nau” (of selma'o CUhE) which can be used to override these rules and get to the speaker's current reference point. (Yes, it sounds like English “now”.) It is not grammatical to combine “nau” with any other cmavo in a tense, except by way of a logical or non-logical connection (see Section 10.20). Here is a convoluted sentence with several nested bridi which uses “nau” at the lowest level:

**Example 10.15.9**

la djan. pu cusku le se du'u  
 la .alis pu cusku le se du'u  
 la djordj. pu cusku le se du'u  
 la maris. nau klama le zarci  
 John *<past>* says the statement-that  
 Alice *<past>* says the statement-that  
 George *<past>* says the statement that  
 Mary *<now>* goes-to the market.  
 John said that Alice had said that George had earlier  
 said that Mary is now going to the market.

The use of “nau” does not affect sticky tenses.

## 10.16 Tense relations between sentences

The sumti tcita method, explained in Section 10.12, of asserting a tense relationship between two events suffers from asymmetry. Specifically,

**Example 10.16.1**

le verba cu cadzu le bisli zu'a le nu le nanmu cu batci le gerku  
 The child walks-on the ice *<left>* the event-of the man bites the dog.  
 The child walks on the ice to the left of where the man bites the dog.

which specifies an imaginary journey leftward from the man biting the dog to the child walking on the ice, claims only that the child walks on the ice. By the nature of “le nu”, the man's biting the dog is merely referred to without being claimed. If it seems desirable to claim both, each event can be expressed as a main sentence bridi, with a special form of “.i” connecting them:

**Example 10.16.2**

le nanmu cu batci le gerku  
 .izu'abo le verba cu cadzu le bisli  
 The man bites the dog.

⟨*Left*⟩ the child walks-on the ice.

The man bites the dog. To the left, the child walks on the ice.

“.izu’abo” is a compound cmavo: the “.i” separates the sentences and the “zu’a” is the tense. The “bo” is required to prevent the “zu’a” from gobbling up the following sumti, namely “le verba”.

Note that the bridri in Example 10.16.2 appear in the reverse order from their appearance in Example 10.16.1. With “.izu’abo” (and all other afterthought tense connectives) the sentence specifying the origin of the journey comes first. This is a natural order for sentences, but requires some care when converting between this form and the sumti tcita form.

Example 10.16.2 means the same thing as:

**Example 10.16.3**

le nanmu cu batci le gerku

.i zu’a la’edi’u le verba cu cadzu le bisli

The man bites the dog.

⟨*Left*⟩ the-referent-of-the-last-sentence the child walks-on the ice.

The man bites the dog.

Left of what I just mentioned, the child walks on the ice.

If the “bo” is omitted, the meaning changes:

**Example 10.16.4**

le nanmu cu batci le gerku

.i zu’a le verba cu cadzu le bisli

The man bites the dog.

⟨*Left*⟩ the child ⟨*something*⟩ walks-on the ice.

The man bites the dog. To the left of the child, something walks on the ice.

Here the first place of the second sentence is unspecified, because “zu’a” has absorbed the sumti “le verba”.

Do not confuse either Example 10.16.2 or Example 10.16.4 with the following:

**Example 10.16.5**

le nanmu cu batci le gerku

.i zu’aku le verba cu cadzu le bisli

The man bites the dog.

⟨*Left*⟩ the child walks-on the ice.

The man bites the dog. Left of me, the child walks on the ice.

In Example 10.16.5, the origin point is the speaker, as is usual with “zu’aku”. Example 10.16.2 makes the origin point of the tense the event described by the first sentence.

Two sentences may also be connected in forethought by a tense relationship. Just like afterthought tense connection, forethought tense connection claims both sentences, and in addition claims that the time or space relationship specified by the tense holds between the events the two sentences describe.

The origin sentence is placed first, preceded by a tense plus “gi”. Another “gi” is used to separate the sentences:

**Example 10.16.6**

pugi mi klama le zarci gi mi klama le zdani  
 ⟨*past*⟩ I go-to the market ⟨,⟩ I go-to the house.  
 Before I go to the market, I go to the house.

A parallel construction can be used to express a tense relationship between sumti:

**Example 10.16.7**

mi klama pugi le zarci gi le zdani  
 I go-to ⟨*past*⟩ the market ⟨,⟩ the house.

Because English does not have any direct way of expressing a tense-like relationship between nouns, Example 10.16.7 cannot be expressed in English without paraphrasing it either into Example 10.16.6 or else into “I go to the house before the market”, which is ambiguous — is the market going?

Finally, a third forethought construction expresses a tense relationship between bridi-tails rather than whole bridi. (The construct known as a “bridi-tail” is explained fully in Chapter 14; roughly speaking, it is a selbri with any following sumti.) Example 10.16.8 is equivalent in meaning to Example 10.16.6 and Example 10.16.7:

**Example 10.16.8**

mi pugi klama le zarci gi klama le zdani  
 I ⟨*past*⟩ go-to the market ⟨,⟩ go-to the house.  
 I, before going to the market, go to the house.

In both Example 10.16.7 and Example 10.16.8, the underlying sentences “mi klama le zarci” and “mi klama le zdani” are not claimed; only the relationship in time between them is claimed.

Both the forethought and the afterthought forms are appropriate with PU, ZI, FAhA, VA, and ZAhO tenses. In all cases, the equivalent forms are (where *x* and *y* stand for sentences, and TENSE for a tense cmavo):

**Definition 10.10**

*subordinate*    *x* TENSE le nu *y*  
*afterthought coordinate*    *y* .i+TENSE+bo *x*  
*forethought coordinate*    TENSE+gi *x* gi *y*

## 10.17 Tensed logical connectives

The Lojban tense system interacts with the Lojban logical connective system. That system is a separate topic, explained in Chapter 14 and touched on only in summary here. By the rules of the logical connective system, Example 10.17.1 through Example 10.17.3 are equivalent in meaning:

**Example 10.17.1**

la teris. satre le mlatu  
 .ije la teris. satre le ractu  
 Terry strokes the cat.  
 And Terry strokes the rabbit.

**Example 10.17.2**

la teris. satre le mlatu gi'e satre le ractu  
 Terry strokes the cat and strokes the rabbit.

**Example 10.17.3**

la teris. satre le mlatu .e le ractu  
 Terry strokes the cat and the rabbit.

Suppose we wish to add a tense relationship to the logical connective “and”? To say that Terry strokes the cat and later strokes the rabbit, we can combine a logical connective with a tense connective by placing the logical connective first, then the tense, and then the cmavo “bo”, thus:

**Example 10.17.4**

la teris. satre le mlatu  
 .ijebabo la teris. satre le ractu  
 Terry strokes the cat.  
 And then Terry strokes the rabbit.

**Example 10.17.5**

la teris. satre le mlatu gi'ebabo satre le ractu  
 Terry strokes the cat, and then strokes the rabbit.

**Example 10.17.6**

la teris. satre le mlatu .ebabo le ractu  
 Terry strokes the cat and then the rabbit.

Example 10.17.4 through 17.6 are equivalent in meaning. They are also analogous to Example 10.17.1 through Example 10.17.3 respectively. The “bo” is required for the same reason as in Example 10.16.2: to prevent the “ba” from functioning as a sumti tcita for the following sumti (or, in Example 10.17.5, from being attached to the following selbri).

In addition to the “bo” construction of Example 10.17.4 through Example 10.17.6, there is also a form of tensed logical connective with “ke ... ke'e” (“tu'e... tu'u” for sentences). The logical connective system makes Example 10.17.7 through Example 10.17.9 equivalent in meaning:

**Example 10.17.7**

mi bevri le dakli  
 .ije tu'e mi bevri le gerku  
 .ija mi bevri le mlatu tu'u  
 I carry the sack.  
 And (I carry the dog.  
 And/or I carry the cat).  
 I carry the sack. And I carry the dog, or I carry  
 the cat, or I carry both.

**Example 10.17.8**

mi bevri le dakli  
 gi'eke bevri le gerku gi'a bevri le mlatu  
 I carry the sack  
 and (carry the dog and/or carry the cat).  
 I carry the sack, and also carry the dog  
 or carry the cat or carry both.

**Example 10.17.9**

mi bevri le dakli .eke le gerku .a le mlatu  
 I carry the sack and (the dog or the cat)  
 I carry the sack and also the dog or the cat or both.

Note the uniformity of the Lojban, as contrasted with the variety of ways in which the English provides for the correct grouping. In all cases, the meaning is that I carry the sack in any case, and either the cat or the dog or both.

To express that I carry the sack first (earlier in time), and then the dog or the cat or both simultaneously, I can insert tenses to form Example 10.17.10 through Example 10.17.12:

**Example 10.17.10**

mi bevri le dakli  
 .ije ba tu'e mi bevri le gerku  
 .ijacabo mi bevri le mlatu tu'u  
 I carry the sack.  
 And *<future>* (I carry the dog.  
 And/or *<present>* I carry the cat.)  
 I carry the sack. And then I will carry the dog  
 or I will carry the cat or I will carry both  
 at once.

**Example 10.17.11**

mi bevri le dakli  
 gi'ebake bevri le gerku  
 gi'acabo bevri le mlatu  
 I carry the sack  
 and *<future>* (carry the dog  
 and/or *<present>* carry the cat).  
 I carry the sack and then will carry the dog  
 or carry the cat or carry both at once.

**Example 10.17.12**

mi bevri le dakli  
 .ebake bevri le gerku .acabo le mlatu  
 I carry the sack and  
*<future>* (the cat and/or *<present>* the dog).  
 I carry the sack, and then the cat or the dog  
 or both at once.

Example 10.17.10 through Example 10.17.12 are equivalent in meaning to each other, and correspond to the tenseless Example 10.17.7 through Example 10.17.9 respectively.

## 10.18 Tense negation

Any bridi which involves tenses of selma'o PU, FAhA, or ZAhO can be contradicted by a “-nai” suffixed to the tense cmavo. Some examples:

### Example 10.18.1

mi punai klama le zarci  
I *<past>* *<not>* go-to the market.  
I didn't go to the market.

As a contradictory negation, Example 10.18.1 implies that the bridi as a whole is false without saying anything about what is true. When the negated tense is a sumti tcita, “-nai” negation indicates that the stated relationship does not hold:

### Example 10.18.2

mi klama le zarci canai le nu do klama le zdani  
I go-to the market *<present>* *<not>* the event-of you go-to the house.  
It is not true that I went to the market at the same time that you went to the house.

### Example 10.18.3

le nanmu batci le gerku ne'inai le kumfa  
The man bites the dog *<within>* *<not>* the room.  
The man didn't bite the dog inside the room.

### Example 10.18.4

mi morsi ca'onai le nu mi jmive  
I am-dead *<continuative - negated>* the event-of I live.  
It is false that I am dead during my life.

It is also possible to perform scalar negation of whole tense constructs by placing a member of NAhE before them. Unlike contradictory negation, scalar negation asserts a truth: that the bridi is true with some tense other than that specified. The following examples are scalar negation analogues of Example 10.18.1 to Example 10.18.3:

### Example 10.18.5

mi na'e pu klama le zarci  
I *<non->* *<past>* go-to the market.  
I go to the market other than in the past.

### Example 10.18.6

le nanmu batci le gerku to'e ne'i le kumfa  
The man bites the dog *<opposite-of>* *<within>* the room.  
The man bites the dog outside the room.

### Example 10.18.7

mi klama le zarci na'e ca le nu do klama le zdani  
I go-to the market *<non->* *<present>* the event-of you go-to the house.  
I went to the market at a time other than the time at which you went to the house.

**Example 10.18.8**

mi morsi na'e ca'o le nu mi jmive  
 I am-dead ⟨*non-*⟩ ⟨*continuative*⟩ the event-of I live.  
 I am dead other than during my life.

Unlike “-nai” contradictory negation, scalar negation of tenses is not limited to PU and FAhA:

**Example 10.18.9**

le verba na'e ri'u cadzu le bisli  
 The child ⟨*non-*⟩ ⟨*right*⟩ walks-on the ice  
 The child walks on the ice other than to my right.

The use of “-nai” on cmavo of TAhE and ROI has already been discussed in Section 10.9; this use is also a scalar negation.

## 10.19 Actuality, potentiality, capability: CAhA

The following cmavo are discussed in this section:

**Definition 10.11**

<i>ca'a</i>	actually is	CAhA
<i>ka'e</i>	is innately capable of	CAhA
<i>nu'o</i>	can but has not	CAhA
<i>pu'i</i>	can and has	CAhA

Lojban bridi without tense markers may not necessarily refer to actual events: they may also refer to capabilities or potential events. For example:

**Example 10.19.1**

ro datka cu flulimna  
 all ducks are-float-swimmers  
 All ducks swim by floating.

is a Lojban truth, even though the colloquial English translation is false or at best ambiguous. This is because the tenseless Lojban bridi doesn't necessarily claim that every duck is swimming or floating now or even at a specific time or place. Even if we add a tense marker to Example 10.19.1,

**Example 10.19.2**

ro datka ca flulimna  
 all ducks ⟨*present*⟩ are-float-swimmers.  
 All ducks are now swimming by floating.

the resulting Example 10.19.2 might still be considered a truth, even though the colloquial English seems even more likely to be false. All ducks have the potential of swimming even if they are not exercising that potential at present. To get the full flavor of “All ducks are now swimming”, we must append a marker from selma'o CAhA to the tense, and say:



**Example 10.19.3**

ro datka ca ca'a flulimna  
 all ducks ⟨*present*⟩ ⟨*actual*⟩ are-float-swimmers  
 All ducks are now actually swimming by floating.

A CAhA cmavo is always placed after any other tense cmavo, whether for time or for space. However, a CAhA cmavo comes before “ki”, so that a CAhA condition can be made sticky. Example 10.19.3 is false in both Lojban and English, since it claims that the swimming is an actual, present fact, true of every duck that exists, whereas in fact there is at least one duck that is not swimming now.

Furthermore, some ducks are dead (and therefore sink); some ducks have just hatched (and do not know how to swim yet), and some ducks have been eaten by predators (and have ceased to exist as separate objects at all). Nevertheless, all these ducks have the innate capability of swimming — it is part of the nature of duckhood. The cmavo “ka'e” expresses this notion of innate capability:

**Example 10.19.4**

ro datka ka'e flulimna  
 all ducks ⟨*capable*⟩ are-float-swimmers.  
 All ducks are innately capable of swimming.

Under some epistemologies, innate capability can be extended in order to apply the innate properties of a mass to which certain individuals belong to the individuals themselves, even if those individuals are themselves not capable of fulfilling the claim of the bridi. For example:

**Example 10.19.5**

la djan. ka'e viska  
 John ⟨*capable*⟩ sees.  
 John is innately capable of seeing.  
 John can see.

might be true about a human being named John, even though he has been blind since birth, because the ability to see is innately built into his nature as a human being. It is theoretically possible that conditions might occur that would enable John to see (a great medical discovery). On the other hand,

**Example 10.19.6**

le cukta ka'e viska  
 The book ⟨*capable*⟩ sees.  
 The book can see.

is not true in most epistemologies, since the ability to see is not part of the innate nature of a book.

Consider once again the newly hatched ducks mentioned earlier. They have the potential of swimming, but have not yet demonstrated that potential. This may be expressed using “nu'o”, the cmavo of CAhA for undemonstrated potential:

**Example 10.19.7**

ro cifydatka nu'o flulimna  
 all infant-ducks *<can but has not>* are-float-swimmers.  
 All infant ducks have an undemonstrated potential for swimming by floating.  
 Baby ducks can swim but haven't yet.

Contrariwise, if Frank is not blind from birth, then “pu'i” is appropriate:

**Example 10.19.8**

la frank. pu'i viska  
 Frank *<can and has>* sees.  
 Frank has demonstrated a potential for seeing.  
 Frank can see and has seen.

Note that the glosses given at the beginning of this section for “ca'a”, “nu'o”, and “pu'i” incorporate “ca” into their meaning, and are really correct for “ca ca'a”, “ca nu'o”, and “ca pu'i”. However, the CAhA cmavo are perfectly meaningful with other tenses than the present:

**Example 10.19.9**

mi pu ca'a klama le zarci  
 I *<past>* *<actual>* go-to the store.  
 I actually went to the store.

**Example 10.19.10**

la frank. pu nu'o klama le zdani  
 Frank *<past>* *<can but has not>* goes-to the store.  
 Frank could have, but will not have, gone to the store (at some understood moment in the future).

As always in Lojban tenses, a missing CAhA can have an indeterminate meaning, or the context can be enough to disambiguate it. Saying

**Example 10.19.11**

ta jelca  
 That burns/is-burning/might-burn/will-burn.

with no CAhA specified can translate the two very different English sentences “That is on fire” and “That is inflammable.” The first demands immediate action (usually), whereas the second merely demands caution. The two cases can be disambiguated with:

**Example 10.19.12**

ta ca ca'a jelca  
 That *<present>* *<actual>* burns.  
 That is on fire.

and

**Example 10.19.13**

ta ka'e jelca  
 That ⟨*capable*⟩ burns.  
 That is capable of burning.  
 That is inflammable.

When no indication is given, as in the simple observative

**Example 10.19.14**

fagri  
 fire

the prudent Lojbanist will assume the meaning “Fire!”

## 10.20 Logical and non-logical connections between tenses

Like many things in Lojban, tenses may be logically connected; logical connection is explained in more detail in Chapter 14. Some of the terminology in this section will be clear only if you already understand logical connectives.

The appropriate logical connectives belong to selma'o JA. A logical connective between tenses can always be expanded to one between sentences:

**Example 10.20.1**

mi pu je ba klama le zarci  
 I ⟨*past*⟩ and ⟨*future*⟩ go-to the market.  
 I went and will go to the market.

means the same as:

**Example 10.20.2**

mi pu klama le zarci  
 .ije mi ba klama le zarci  
 I ⟨*past*⟩ go-to the market.  
 And I ⟨*future*⟩ go-to the market.  
 I went to the market, and I will go to the market.

Tense connection and tense negation are combined in:

**Example 10.20.3**

mi punai je canai je ba klama le zarci  
 I ⟨*past*⟩ ⟨*not*⟩ and ⟨*present*⟩ ⟨*not*⟩ and ⟨*future*⟩ go-to the market.  
 I haven't yet gone to the market, but I will in future.

Example 10.20.3 is far more specific than

**Example 10.20.4**

mi ba klama le zarci  
 I ⟨*future*⟩ go-to the market.

which only says that I will go, without claiming anything about my past or present. “ba” does not imply “punai” or “canai”; to compel that interpretation, either a logical connection or a ZAhO is needed.

Tense negation can often be removed in favor of negation in the logical connective itself. The following examples are equivalent in meaning:

**Example 10.20.5**

mi mo'izu'anai je mo'iri'u cadzu  
 I ⟨*motion*⟩ ⟨*left-not*⟩ and ⟨*motion*⟩ ⟨*right*⟩ walk.  
 I walk not leftward but rightward.

**Example 10.20.6**

mi mo'izu'a naje mo'iri'u cadzu  
 I ⟨*motion*⟩ ⟨*left*⟩ not-and ⟨*motion*⟩ ⟨*right*⟩ walk.  
 I walk not leftward but rightward.

There are no forethought logical connections between tenses allowed by the grammar, to keep tenses simpler. Nor is there any way to override simple left-grouping of the connectives, the Lojban default.

The non-logical connectives of selma'o JOI, BIhI, and GAhO are also permitted between tenses. One application is to specify intervals not by size, but by their end-points (“bi'o” belongs to selma'o BIhI, and connects the end-points of an ordered interval, like English “from ... to”):

**Example 10.20.7**

mi puza bi'o bazu vasxu  
 I ⟨*past*⟩ ⟨*medium*⟩ from ... to ⟨*future*⟩ ⟨*long*⟩ breathe.  
 I breathe from a medium time ago till a long time to come.

(It is to be hoped that I have a long life ahead of me.)

One additional use of non-logical connectives within tenses is discussed in Section 10.21. Other uses will probably be identified in future.

## 10.21 Sub-events

Another application of non-logical tense connection is to talk about sub-events of events. Consider a six-shooter: a gun which can fire six bullets in succession before reloading. If I fire off the entire magazine twice, I can express the fact in Lojban thus:

**Example 10.21.1**

mi reroi pi'u xaroi cecla le seldanti  
 I ⟨*twice*⟩ ⟨*cross-product*⟩ ⟨*six times*⟩ shoot the projectile-launcher.  
 On two occasions, I fire the gun six times.

It would be confusing, though grammatical, to run the “reroi” and the “xaroi” directly together. However, the non-logical connective “pi'u” expresses a Cartesian product (also known as a cross product) of two sets. In this case, there is a set of two firings each of which is represented by a set of six shots, for twelve shots in all (hence the name “product”: the product of 2 and 6 is 12). Its use specifies very precisely what occurs.

In fact, you can specify strings of interval properties and event contours within a single tense without the use of a logical or non-logical connective *cmavo*. This allows tenses of the type:

**Example 10.21.2**

la djordj. ca'o co'a ciska  
George <*continuative*> <*initiative*> writes.  
George continues to start to write.

**Example 10.21.3**

mi reroi ca'o xaroi darxi le damri  
I <*twice*> <*continuative*> <*six times*> hit the drum.  
On two occasions, I continue to beat the drum six times.

## 10.22 Conversion of sumti tcita: JAI

The following *cmavo* are discussed in this section:

**Definition 10.12**

<i>jai</i>	tense conversion	<i>JAI</i>
<i>fai</i>	indefinite place	<i>FA</i>

Conversion is the regular Lojban process of moving around the places of a place structure. The *cmavo* of *selma'o SE* serve this purpose, exchanging the first place with one of the others:

**Example 10.22.1**

mi cu klama le zarci  
I go-to the market.

**Example 10.22.2**

le zarci cu se klama mi  
The market is-gone-to by-me.

It is also possible to bring a place that is specified by a sumti tcita (for the purposes of this chapter, a tense sumti tcita) to the front, by using “*jai*” plus the tense as the grammatical equivalent of *SE*:

**Example 10.22.3**

le ratcu cu citka le cirla vi le panku  
The rat eats the cheese <*short distance*> the park.  
The rat eats the cheese in the park.

**Example 10.22.4**

le panku cu jai vi citka le cirla fai le ratcu  
The park is-the-place-of eating the cheese by-the rat.  
The park is where the rat eats the cheese.

In Example 10.22.4, the construction JAI+tense converts the location sumti into the first place. The previous first place has nowhere to go, since the location sumti is not a numbered place; however, it can be inserted back into the bridi with “fai”, the indefinite member of selma’o FA. (The other members of FA are used to mark the first, second, etc. places of a bridi explicitly:

**Example 10.22.5**  
fa mi cu klama fe le zarci

means the same as:

**Example 10.22.6**  
fe le zarci cu klama fa mi

as well as the simple:

**Example 10.22.7**  
mi cu klama le zarci

in which the place structure is determined by position.)

Like SE conversion, JAI+tense conversion is especially useful in descriptions with LE selma’o:

**Example 10.22.8**  
mi viska le jai vi citka be le cirla  
I saw the place-of eating the cheese.

Here the eater of the cheese is elided, so no “fai” appears.  
Of course, temporal tenses are also usable with JAI:

**Example 10.22.9**  
mi djuno fi le jai ca morsi be fai la djan.  
I know about the ⟨*present*⟩ is-dead of-the-one-called “John”  
I know the time of John’s death.  
I know when John died.

## 10.23 Tenses versus modals

Grammatically, every use of tenses seen so far is exactly paralleled by some use of modals as explained in Chapter 9. Modals and tenses alike can be followed by sumti, can appear before the selbri, can be used in pure and mixed connections, can participate in JAI conversions. The parallelism is perfect. However, there is a deep difference in the semantics of tense constructs and modal constructs, grounded in historical differences between the two forms. Originally, modals and tenses were utterly different things in earlier versions of Loglan; only in Lojban have they become grammatically interchangeable. And even now, differences in semantics continue to be maintained.

The core distinction is that whereas the modal bridi

**Example 10.23.1**

mi nelci do mu'i le nu do nelci mi  
 I like you with-motivation the event-of you like me.  
 I like you because you like me.

places the “le nu” sumti in the  $x_1$  place of the gismu “mukti” (which underlies the modal “mu'i”), namely the motivating event, the tensed bridi

**Example 10.23.2**

mi nelci do ba le nu do nelci mi  
 I like you after the event-of you like me.  
 I like you after you like me.

places the “le nu” sumti in the  $x_2$  place of the gismu “balvi” (which underlies the tense “ba”), namely the point of reference for the future tense. Paraphrases of Example 10.23.1 and Example 10.23.2, employing the brivla “mukti” and “balvi” explicitly, would be:

**Example 10.23.3**

le nu do nelci mi cu mukti le nu mi nelci do  
 The event-of you like me motivates the event-of I like you  
 Your liking me is the motive for my liking you.

and

**Example 10.23.4**

le nu mi nelci do cu balvi le nu do nelci mi  
 The event-of I like you is after the event of you like me.  
 My liking you follows (in time) your liking me.

(Note that the paraphrase is not perfect due to the difference in what is claimed; Example 10.23.3 and Example 10.23.4 claim only the causal and temporal relationships between the events, not the existence of the events themselves.) As a result, the afterthought sentence-connective forms of Example 10.23.1 and Example 10.23.2 are, respectively:

**Example 10.23.5**

mi nelci do .imu'ibo do nelci mi  
 I like you. ⟨That is⟩ Because you like me.

**Example 10.23.6**

do nelci mi .ibabo mi nelci do  
 You like me. Afterward, I like you.

In Example 10.23.5, the order of the two bridi “mi nelci do” and “do nelci mi” is the same as in Example 10.23.1. In Example 10.23.6, however, the order is reversed: the origin point “do nelci mi” physically appears before the future-time event “mi nelci do”. In both cases, the bridi characterizing the event in the  $x_2$  place appears before the bridi characterizing the event in the  $x_1$  place of “mukti” or “balvi”.

In forethought connections, however, the asymmetry between modals and tenses is not found. The forethought equivalents of Example 10.23.5 and Example 10.23.6 are

**Example 10.23.7**

mu’igi do nelci mi gi mi nelci do  
Because you like me, I like you.

and

**Example 10.23.8**

bagi do nelci mi gi mi nelci do  
After you like me, I like you.

respectively.

The following modal sentence schemata (where  $x$  and  $y$  represent sentences) all have the same meaning:

**Example 10.23.9**

$x$  .i BAI bo  $y$   
BAI gi  $y$  gi  $x$   
 $x$  BAI le nu  $y$

whereas the following tensed sentence schemata also have the same meaning:

**Example 10.23.10**

$x$  .i TENSE bo  $y$   
TENSE gi  $x$  gi  $y$   
 $y$  TENSE le nu  $x$

neglecting the question of what is claimed. In the modal sentence schemata, the modal tag is always followed by  $y$ , the sentence representing the event in the  $x_1$  place of the gismu that underlies the BAI. In the tensed sentences, no such simple rule exists.

## 10.24 Tense questions: “cu’e”

The following cmavo is discussed in this section:

**Definition 10.13**

*cu’e*      tense question

*CUhE*

There are two main ways to ask questions about tense. The main English tense question words are “When?” and “Where?”. These may be paraphrased respectively as “At what time?” and “At what place?” In these forms, their Lojban equivalents simply involve a tense plus “ma”, the Lojban sumti question:

**Example 10.24.1**

do klama le zdani ca ma  
you go-to the house *<present>* *<what sumti?>*.  
You go to the house at what time?  
When do you go to the house?



**Example 10.24.2**

le verba vi ma pu cadzu le bisli  
 The child *<short space>* *<what sumti?>* *<past>* walks-on the ice.  
 The child at/near what place walked on the ice?  
 Where did the child walk on the ice?

There is also a non-specific tense and modal question, “cu’e”, belonging to selma’o CUhE. This can be used wherever a tense or modal construct can be used.

**Example 10.24.3**

le nanmu cu’e batci le gerku  
 The man *<what tense?>* bites the dog.  
 When/Where/How does the man bite the dog?

Possible answers to Example 10.24.3 might be:

**Example 10.24.4**

va  
*<medium space>*.  
 Some ways from here.

**Example 10.24.5**

puzu  
*<past>* *<long time>*.  
 A long time ago.

**Example 10.24.6**

vi le lunra  
*<short space>* The moon.  
 On the moon.

**Example 10.24.7**

pu’o  
*<inchoative>*  
 He hasn’t yet done so.

or even the modal reply (from selma’o BAI; see Chapter 9):

**Example 10.24.8**

bai la djan.  
 Under John’s compulsion.

The only way to combine “cu’e” with other tense cmavo is through logical connection, which makes a question that pre-specifies some information:

**Example 10.24.9**

do puzi je cu’e sombo le gurni  
 You *<past>* *<short>* and *<when?>* sow the grain?  
 You sowed the grain a little while ago; when else do you sow it?

Additionally, the logical connective itself can be replaced by a question word:

**Example 10.24.10**

la .artr. pu je'i ba nolraitru  
 Arthur *<past>* *<which?>* *<future>* is-a-king  
 Was Arthur a king or will he be?

Answers to Example 10.24.10 would be logical connectives such as “je”, meaning “both”, “naje” meaning “the latter”, or “jenai” meaning “the former”.

## 10.25 Explicit magnitudes

It is a limitation of the VA and ZI system of specifying magnitudes that they can only prescribe vague magnitudes: small, medium, or large. In order to express both an origin point and an exact distance, the Lojban construction called a *termset* is employed. (Termsets are explained further in Chapter 14 and Chapter 16.) It is grammatical for a termset to be placed after a tense or modal tag rather than a sumti, which allows both the origin of the imaginary journey and its distance to be specified. Here is an example:

**Example 10.25.1**

la frank. sanli zu'a nu'i la djordj. lu'a lo mitre be li mu *<nu'u>*  
 Frank stands *<left>* *<start termset>* George *<quantity>* a thing-measuring-in-meters the-  
 number 5 *<end termset>*.  
 Frank is standing five meters to the left of George.

Here the termset extends from the “nu'i” to the implicit “nu'u” at the end of the sentence, and includes the terms “la djordj.”, which is the unmarked origin point, and the tagged sumti “lo mitre be li mu”, which the cmavo “la'u” (of selma'o BAI, and meaning “with quantity”; see Chapter 9) marks as a quantity. Both terms are governed by the tag “zu'a”

It is not necessary to have both an origin point and an explicit magnitude: a termset may have only a single term in it. A less precise version of Example 10.25.1 is:

**Example 10.25.2**

la frank. sanli zu'a nu'i lu'a lo mitre be li mu  
 Frank stands *<left>* *<termset>* *<quantity>* a thing-measuring-in-meters the-number 5.  
 Frank stands five meters to the left.

Finally (an exercise for the much-tried reader):

**Example 10.25.3**

a'o do pu seju ba roroi ca'o fe'e su'oroi jimpe fi le lojbo temci selsku ciste

## 10.26 Summary of tense selma'o

### 10.26.1 Temporal direction

**Definition 10.14**

<i>pu</i>	past	<i>PU</i>
<i>ca</i>	present	<i>PU</i>
<i>ba</i>	future	<i>PU</i>

**10.26.2 Temporal distance****Definition 10.15**

<i>zi</i>	short	<i>ZI</i>
<i>za</i>	medium	<i>ZI</i>
<i>zu</i>	long	<i>ZI</i>

**10.26.3 Temporal interval****Definition 10.16**

<i>ze'i</i>	short	<i>ZEhA</i>
<i>ze'a</i>	medium	<i>ZEhA</i>
<i>ze'u</i>	long	<i>ZEhA</i>
<i>ze'e</i>	infinite	<i>ZEhA</i>

**10.26.4 Objective quantified tense flag****Definition 10.17**

<i>noroi</i>	never	<i>ROI</i>
<i>paroi</i>	once	<i>ROI</i>
<i>n-roi</i>	<i>n</i> times	<i>ROI</i>
<i>roroi</i>	always	<i>ROI</i>

**10.26.5 Subjective quantified tense****Definition 10.18**

<i>di'i</i>	regularly	<i>TAhE</i>
<i>na'o</i>	typically	<i>TAhE</i>
<i>ru'i</i>	continuously	<i>TAhE</i>
<i>ta'e</i>	habitually	<i>TAhE</i>

**10.26.6 Spatial distance****Definition 10.19**

<i>vi</i>	short	<i>VI</i>
<i>va</i>	medium	<i>VI</i>
<i>vu</i>	long	<i>VI</i>

**10.26.7 Spatial interval**

**Definition 10.20**

<i>ve'i</i>	short	<i>VEhA</i>
<i>ve'a</i>	medium	<i>VEhA</i>
<i>ve'u</i>	long	<i>VEhA</i>
<i>ve'e</i>	infinite	<i>VEhA</i>

**10.26.8 Spatial dimensionality****Definition 10.21**

<i>vi'i</i>	line	<i>VThA</i>
<i>vi'a</i>	plane	<i>VThA</i>
<i>vi'u</i>	space	<i>VThA</i>
<i>vi'e</i>	space-time	<i>VThA</i>

**10.26.9 Spatial interval modifier flag****Definition 10.22**

<i>fe'enoroi</i>	nowhere	<i>FEhE</i>
<i>fe'eroroi</i>	everywhere	<i>FEhE</i>
<i>fe'eba'o</i>	beyond	<i>FEhE</i>

**10.26.10 Set or reset sticky tense****Definition 10.23**

<i>tense + ki</i>	set	<i>KI</i>
<i>ki alone</i>	reset	<i>KI</i>

**10.26.11 Tense question, reference point****Definition 10.24**

<i>cu'e</i>	asks for a tense or aspect	<i>CUhE</i>
<i>nau</i>	use speaker's reference point	<i>CUhE</i>

**10.26.12 Tense conversion****Definition 10.25**

<i>jaica</i>	the time of
<i>jaivi</i>	place of

**10.27 List of spatial directions and direction-like relations**

The following list of FAhA cmavo gives rough English glosses for the cmavo, first when used without “mo'i” to express a direction in the third column, and then when used with “mo'i” to express movement in the direction in the fourth column. When possible, the gismu from which the cmavo is derived is also listed in the second column.

**Definition 10.26**

<i>ca'u</i>	crane	in front (of)	forward
<i>ti'a</i>	trixe	behind	backward
<i>zu'a</i>	zunle	on the left (of)	leftward
<i>ri'u</i>	pritu	on the right (of)	rightward
<i>ga'u</i>	gapru	above	upward(ly)
<i>ni'a</i>	cnita	below	downward(ly)
<i>ne'i</i>	nenri	within	into
<i>ru'u</i>	sruri	surrounding	orbiting
<i>pa'o</i>	pagre	transfixing	passing through
<i>ne'a</i>		next to	moving while next to
<i>te'e</i>		bordering	moving along the border (of)
<i>re'o</i>		adjacent (to)	along
<i>fa'a</i>	farna	towards	arriving at
<i>to'o</i>		away from	departing from
<i>zo'i</i>		inward (from)	approaching
<i>ze'o</i>		outward (from)	receding from
<i>zo'a</i>		tangential (to)	passing (by)
<i>bu'u</i>		coincident (with)	moving to coincide with
<i>be'a</i>	berti	north (of)	northward(ly)
<i>ne'u</i>	snanu	south (of)	southward(ly)
<i>du'a</i>	stuna	east (of)	eastward(ly)
<i>vu'a</i>		west (of)	westward(ly)

Note: “zo'i” and “ze'o” refer to direction towards or away from the speaker’s location, or whatever the origin is and “fa'a” and “to'o” refer to direction towards or away from some other point.



# Events, Qualities, Quantities, and Other Vague Words: On Lojban Abstraction



*le si'o kunti*

## 11.1 The syntax of abstraction

The purpose of the feature of Lojban known as “abstraction” is to provide a means for taking whole bridi and packaging them up, as it were, into simple selbri. Syntactically, abstractions are very simple and uniform; semantically, they are rich and complex, with few features in common between one variety of abstraction and another. We will begin by discussing syntax without regard to semantics; as a result, the notion of abstraction may seem unmotivated at first. Bear with this difficulty until Section 11.2.

An abstraction selbri is formed by taking a full bridi and preceding it by any cmavo of selma'o NU. There are twelve such cmavo; they are known as “abstractors”. The bridi is closed by the elidable terminator “kei”, of selma'o KEI. Thus, to change the bridi

### Example 11.1.1

mi klama le zarci  
I go-to the store

into an abstraction using “nu”, one of the members of selma’o NU, we change it into:

**Example 11.1.2**

nu mi klama le zarci <kei>  
an-event-of my going-to the store

The bridi may be a simple selbri, or it may have associated sumti, as here. It is important to beware of eliding “kei” improperly, as many of the common uses of abstraction selbri involve following them with words that would appear to be part of the abstraction if “kei” had been elided.

(Technically, “kei” is never necessary, because the elidable terminator “vau” that closes every bridi can substitute for it; however, “kei” is specific to abstractions, and using it is almost always clearer.)

The grammatical uses of an abstraction selbri are exactly the same as those of a simple brivla. In particular, abstraction selbri may be used as observatives, as in Example 11.1.2, or used in tanru:

**Example 11.1.3**

la djan. cu nu sonci kei djica  
John is-an-(event-of being-a-soldier) type-of desirer.  
John wants to be a soldier.

Abstraction selbri may also be used in descriptions, preceded by “le” (or any other member of selma’o LE):

**Example 11.1.4**

la djan. cu djica le nu sonci <kei>  
John desires the event-of being-a-soldier.

We will most often use descriptions containing abstraction either at the end of a bridi, or just before the main selbri with its “cu”; in either of these circumstances, “kei” can normally be elided.

The place structure of an abstraction selbri depends on the particular abstractor, and will be explained individually in the following sections.

Note: In glosses of bridi within abstractions, the grammatical form used in the English changes. Thus, in the gloss of Example 11.1.2 we see “my going-to the store” rather than “I go-to the store”; likewise, in the glosses of Example 11.1.3 and Example 11.1.4 we see “being-a-soldier” rather than “is-a-soldier”. This procedure reflects the desire for more understandable glosses, and does not indicate any change in the Lojban form. A bridi is a bridi, and undergoes no change when it is used as part of an abstraction selbri.

## 11.2 Event abstraction

The following cmavo is discussed in this section:

**Definition 11.1**

*nu* event abstractor

NU



The examples in Section 11.1 made use of “nu” as the abstractor, and it is certainly the most common abstractor in Lojban text. Its purpose is to capture the event or state of the bridi considered as a whole. Do not confuse the “le” description built on a “nu” abstraction with ordinary descriptions based on “le” alone. The following sumti are quite distinct:

**Example 11.2.1**

le klama  
the comer, that which comes

**Example 11.2.2**

le se klama  
the destination

**Example 11.2.3**

le te klama  
the origin

**Example 11.2.4**

le ve klama  
the route

**Example 11.2.5**

le xe klama  
the means of transportation

**Example 11.2.6**

le nu klama  
the event of someone coming to somewhere from somewhere by some route using some means

Example 11.2.1 through Example 11.2.5 are descriptions that isolate the five individual sumti places of the selbri “klama”. Example 11.2.6 describes something associated with the bridi as a whole: the event of it.

In Lojban, the term “event” is divorced from its ordinary English sense of something that happens over a short period of time. The description:

**Example 11.2.7**

le nu mi vasxu  
the event-of my breathing

is an event which lasts for the whole of my life (under normal circumstances). On the other hand,

**Example 11.2.8**

le nu la djan. cinba la djein.  
the event-of John kissing Jane

is relatively brief by comparison (again, under normal circumstances).

We can see from Example 11.2.6 through Example 11.2.8 that ellipsis of sumti is valid in the bridi of abstraction selbri, just as in the main bridi of a sentence. Any sumti may be ellipsized if the listener will be able to figure out from context what the proper value of it is, or else to recognize that the proper value is unimportant. It is extremely common for “nu” abstractions in descriptions to have the  $x_1$  place ellipsized:

**Example 11.2.9**

mi nelci le nu limna  
I like the event-of swimming.  
I like swimming.

is elliptical, and most probably means:

**Example 11.2.10**

mi nelci le nu mi limna  
I like the event-of I swim.

In the proper context, of course, Example 11.2.9 could refer to the event of somebody else swimming. Its English equivalent, “I like swimming”, can’t be interpreted as “I like Frank’s swimming”; this is a fundamental distinction between English and Lojban. In Lojban, an omitted sumti can mean whatever the context indicates that it should mean.

Note that the lack of an explicit NU cmavo in a sumti can sometimes hide an implicit abstraction. In the context of Example 11.2.10, the appearance of “le se nelci” (“that which is liked”) is in effect an abstraction: “

**Example 11.2.11**

le se nelci cu cafne  
The liked-thing is-frequent.  
The thing which I like happens often.

which in this context means “My swimming happens often.” Event descriptions with “le nu” are commonly used to fill the “under conditions...” places, among others, of gismu and lujvo place structures:

**Example 11.2.12**

la lojban. cu frili mi le nu mi tadni *<kei>*  
Lojban is-easy for-me under-conditions-the event-of I study  
Lojban is easy for me when I study.

(The “when” of the English would also be appropriate for a construction involving a Lojban tense, but the Lojban sentence says more than that the studying is concurrent with the ease.) The place structure of a “nu” abstraction selbri is simply “ $x_1$  is an event of (the bridi)”.

## 11.3 Types of event abstractions

The following cmavo are discussed in this section:

**Definition 11.2**

<i>mu'e</i>	point-event abstractor	<i>NU</i>
<i>pu'u</i>	process abstractor	<i>NU</i>
<i>zu'o</i>	activity abstractor	<i>NU</i>
<i>za'i</i>	state abstractor	<i>NU</i>

Event abstractions with “nu” suffice to express all kinds of events, whether long, short, unique, repetitive, or whatever. Lojban also has more finely discriminating machinery for talking about events, however. There are four other abstractors of selma'o NU for talking about four specific types of events, or four ways of looking at the same event.

An event considered as a point in time is called a *point-event*, or sometimes an *achievement*. (This latter word should be divorced, in this context, from all connotations of success or triumph.) A point-event can be extended in duration, but it is still a point-event if it is thought of as unitary, having no internal structure. The abstractor “mu'e” means “point-event-of”:

**Example 11.3.1**

le mu'e la djan. catra la djim. cu zekri  
 the point-event-of (John kills Jim) is-a-crime  
 John's killing Jim (considered as a point in time) is a crime.

An event considered as extended in time, and structured with a beginning, a middle containing one or more stages, and an end, is called a *process*. The abstractor “pu'u” means “process-of”:

**Example 11.3.2**

ca'o le pu'u le latmo balje'a cu porpi kei so'i je'atru cu selcatra  
 ⟨*continuitive*⟩ the process-of(the Latin great-state breaking-up) many state-rulers were-killed  
 During the fall of the Roman Empire, many Emperors were killed.

An event considered as extended in time and cyclic or repetitive is called an *activity*. The abstractor “zu'o” means “activity-of”:

**Example 11.3.3**

mi tatpi ri'a le zu'o mi plipe  
 I am-tired because-of the activity-of (I jump)  
 I am tired because I jump.

An event considered as something that is either happening or not happening, with sharp boundaries, is called a *state*. The abstractor “za'i” means “state-of”:

**Example 11.3.4**

le za'i mi jmive cu ckape do  
 the state-of (I am-alive) is-dangerous-to you  
 My being alive is dangerous to you.

The abstractors in Example 11.3.1 through Example 11.3.4 could all have been replaced by “nu”, with some loss of precision. Note that Lojban allows every sort of event to be viewed in any of these four ways:

1. The “state of running” begins when the runner starts and ends when the runner stops;
2. The “activity of running” consists of the cycle “lift leg, step forward, drop leg, lift other leg...” (each such cycle is a process, but the activity consists in the repetition of the cycle);
3. The “process of running” puts emphasis on the initial sprint, the steady speed, and the final slowdown;
4. The “achievement of running” is most alien to English, but sees the event of running as a single indivisible thing, like “Pheidippides’ run from Marathon to Athens” (the original marathon).

Further information on types of events can be found in Section 11.12.

The four event type abstractors have the following place structures:

**Definition 11.3**

<i>mu’e</i>	$x_1$ is a point event of (the bridj)
<i>pu’u:</i>	$x_1$ is a process of (the bridj) with stages $x_2$
<i>za’i</i>	$x_1$ is a continuous state of (the bridj) being true

*zu’o:*  $x_1$  is an activity of (the bridj) consisting of repeated actions  $x_2$

## 11.4 Property abstractions

The following cmavo are discussed in this section:

**Definition 11.4**

<i>ka</i>	property abstractor	<i>NU</i>
<i>ce’u</i>		<i>KOhA</i>

The things described by “le nu” descriptions (or, to put it another way, the things of which “nu” selbri may correctly be predicated) are only moderately “abstract”. They are still closely tied to happenings in space and time. Properties, however, are much more ethereal. What is “the property of being blue”, or “the property of being a go-er”? They are what logicians call “intensions”. If John has a heart, then “the property of having a heart” is an abstract object which, when applied to John, is true. In fact,

**Example 11.4.1**

la djan. cu se risna zo’e  
 John has-as-heart something-unspecified.  
 John has a heart.

has the same truth conditions as

**Example 11.4.2**

la djan. cu ckaji le ka se risna ⟨zo’e⟩ ⟨kei⟩  
 John has-the-property the property-of having-as-heart something.  
 John has the property of having a heart.

(The English word “have” frequently appears in any discussion of Lojban properties: things are said to “have” properties, but this is not the same sense of “have” as in “I have money”, which is possession.)

Property descriptions, like event descriptions, are often wanted to fill places in brivla place structures:

**Example 11.4.3**

do cnino mi le ka xunre *<kei>*

You are-new to-me in-the-quality-of-the property-of being-red.

You are new to me in redness.

(The English suffix “-ness” often signals a property abstraction, as does the suffix “-ity”.)

We can also move the property description to the  $x_1$  place of Example 11.4.3, producing:

**Example 11.4.4**

le ka do xunre *<kei>* cu cnino mi

The property-of your being-red is-new to me.

Your redness is new to me.

It would be suitable to use Example 11.4.3 and Example 11.4.4 to someone who has returned from the beach with a sunburn.

There are several different properties that can be extracted from a bridi, depending on which place of the bridi is “understood” as being specified externally. Thus:

**Example 11.4.5**

ka mi prami *<zo'e>* *<kei>*

a-property-of me loving something-unspecified

is quite different from

**Example 11.4.6**

ka *<zo'e>* prami mi *<kei>*

a-property-of something-unspecified loving me

In particular, sentences like Example 11.4.7 and Example 11.4.8 are quite different in meaning:

**Example 11.4.7**

la djan. cu zmadu la djordj. le ka mi prami

John exceeds George in-the property-of (I love X)

I love John more than I love George.

**Example 11.4.8**

la djan. cu zmadu la djordj. le ka prami mi

John exceeds George in the property of (X loves me).

John loves me more than George loves me.

The “X” used in the glosses of Example 11.4.7 through Example 11.4.8 as a place-holder cannot be represented only by ellipsis in Lojban, because ellipsis means that there must be a

specific value that can fill the ellipsis, as mentioned in Section 11.2. Instead, the cmavo “ce’u” of selma’o KOhA is employed when an explicit sumti is wanted. (The form “X” will be used in literal translations.)

Therefore, an explicit equivalent of Example 11.4.7, with no ellipsis, is:

**Example 11.4.9**

la djan. cu zmadu la djordj. le ka mi prami ce’u  
John exceeds George in-the property-of (I love X).

and of Example 11.4.8 is:

**Example 11.4.10**

la djan. cu zmadu la djordj. le ka ce’u prami mi  
John exceeds George in-the property-of (X loves me).

This convention allows disambiguation of cases like:

**Example 11.4.11**

le ka ⟨zo’e⟩ dunda le xirma ⟨zo’e⟩ ⟨kei⟩  
the property-of giving the horse

into

**Example 11.4.12**

le ka ce’u dunda le xirma ⟨zo’e⟩ ⟨kei⟩  
the property-of (X is-a-giver of-the horse to someone-unspecified)  
the property of being a giver of the horse

which is the most natural interpretation of Example 11.4.11, versus

**Example 11.4.13**

le ka ⟨zo’e⟩ dunda le xirma ce’u ⟨kei⟩  
the property-of (someone-unspecified is-a-giver of-the horse to X)  
the property of being one to whom the horse is given

which is also a possible interpretation.

It is also possible to have more than one “ce’u” in a “ka” abstraction, which transforms it from a property abstraction into a relationship abstraction, a resource of the language that has not yet been explored.

The place structure of “ka” abstraction selbri is simply “ $x_1$  is a property of (the bridj)”.

## 11.5 Amount abstractions

The following cmavo is discussed in this section:

**Definition 11.5**

*ni* amount abstraction

*NU*

Amount abstractions are far more limited than event or property abstractions. They really make sense only if the selbri of the abstracted bridi is subject to measurement of some sort. Thus we can speak of:

**Example 11.5.1**

le ni le pixra cu blanu *<kei>*  
 the amount-of (the picture being-blue)  
 the amount of blueness in the picture

because “blueness” could be measured with a colorimeter or a similar device. However,

**Example 11.5.2**

le ni la djein. cu mamta *<kei>*  
 the amount-of (Jane being-a-mother)  
 the amount of Jane’s mother-ness (?)  
 the amount of mother-ness in Jane (?)

makes very little sense in either Lojban or English. We simply do not have any sort of measurement scale for being a mother.

Semantically, a sumti with “le ni” is a number; however, it cannot be treated grammatically as a quantifier in Lojban unless prefixed by the mathematical cmavo “mo’e”:

**Example 11.5.3**

li pa vu’u mo’e  
 le ni le pixra cu blanu *<kei>*  
 the-number 1 minus the-operand  
 the amount-of (the picture being-blue)  
 1 - *b*, where *b* = blueness of the picture

Mathematical Lojban is beyond the scope of this chapter, and is explained more fully in Chapter 18.

There are contexts where either property or amount abstractions make sense, and in such constructions, amount abstractions can make use of “ce’u” just like property abstractors. Thus,

**Example 11.5.4**

le pixra cu cenba le ka ce’u blanu *<kei>*  
 the picture varies in-the property-of (X is blue)  
 The picture varies in being blue.  
 The picture varies in blueness.

is not the same as

**Example 11.5.5**

le pixra cu cenba le ni ce’u blanu *<kei>*  
 the picture varies in-the amount-of (X is blue)  
 The picture varies in how blue it is.  
 The picture varies in blueness.

Example 11.5.4 conveys that the blueness comes and goes, whereas Example 11.5.5 conveys that its quantity changes over time.

Whenever we talk of measurement of an amount, there is some sort of scale, and so the place structure of “ni” abstraction selbri is “ $x_1$  is the amount of (the bridi) on scale  $x_2$ ”.

Note: the best way to express the  $x_2$  places of abstract sumti is to use something like “le ni ... kei be”. See Example 11.9.5 for the use of this construction.

## 11.6 Truth-value abstraction: “jei”

The “blueness of the picture” discussed in Section 11.5 refers to the measurable amount of blue pigment (or other source of blueness), not to the degree of truth of the claim that blueness is present. That abstraction is expressed in Lojban using “jei”, which is closely related semantically to “ni”. In the simplest cases, “le jei” produces not a number but a truth value:

### Example 11.6.1

le jei li re su'i re du li vo *<kei>*  
 the truth-value-of the-number 2 + 2 = the-number 4  
 the truth of 2 + 2 being 4

is equivalent to “truth”, and

### Example 11.6.2

le jei li re su'i re du li mu *<kei>*  
 the truth-value-of the-number 2 + 2 = the-number 5  
 the truth of 2 + 2 being 5

is equivalent to “falsehood”.

However, not everything in life (or even in Lojban) is simply true or false. There are shades of gray even in truth value, and “jei” is Lojban’s mechanism for indicating the shade of grey intended:

### Example 11.6.3

mi ba jdice le jei la djordj. cu zekri gasnu *<kei>*  
 I *<future>* decide the truth-value of (George being-a-(crime doer)).  
 I will decide whether George is a criminal.

Example 11.6.3 does not imply that George is, or is not, definitely a criminal. Depending on the legal system I am using, I may make some intermediate decision. As a result, “jei” requires an  $x_2$  place analogous to that of “ni”: “ $x_1$  is the truth value of (the bridi) under epistemology  $x_2$ ”.

Abstractions using “jei” are the mechanism for fuzzy logic in Lojban; the “jei” abstraction refers to a number between 0 and 1 inclusive (as distinct from “ni” abstractions, which are often on open-ended scales). The detailed conventions for using “jei” in fuzzy-logic contexts have not yet been established.

## 11.7 Predication/sentence abstraction

The following cmavo is discussed in this section:



**Definition 11.6***du'u* predication abstraction

NU

There are some selbri which demand an entire predication as a sumti; they make claims about some predication considered as a whole. Logicians call these the “propositional attitudes”, and they include (in English) things like knowing, believing, learning, seeing, hearing, and the like. Consider the English sentence:

**Example 11.7.1**

I know that Frank is a fool.

How’s that in Lojban? Let us try:

**Example 11.7.2**

mi djuno le nu la frank. cu bebna *<kei>*  
I know the event of Frank being a fool.

Not quite right. Events are actually or potentially physical, and can’t be contained inside one’s mind, except for events of thinking, feeling, and the like; Example 11.7.2 comes close to claiming that Frank’s being-a-fool is purely a mental activity on the part of the speaker. (In fact, Example 11.7.2 is an instance of improperly marked “sumti raising”, a concept discussed further in Section 11.10).

Try again:

**Example 11.7.3**

mi djuno le jei la frank. cu bebna *<kei>*  
I know the truth-value of Frank being a fool.

Closer. Example 11.7.3 says that I know whether or not Frank is a fool, but doesn’t say that he is one, as Example 11.7.1 does. To catch that nuance, we must say:

**Example 11.7.4**

mi djuno le du'u la frank. cu bebna *<kei>*  
I know the predication that Frank is a fool.

Now we have it. Note that the implied assertion “Frank is a fool” is not a property of “le du'u” abstraction, but of “djuno”; we can only know what is in fact true. (As a result, “djuno” like “jei” has a place for epistemology, which specifies how we know.) Example 11.7.5 has no such implied assertion:

**Example 11.7.5**

mi kucli le du'u la frank. cu bebna *<kei>*  
I am curious about whether Frank is a fool.

and here “du'u” could probably be replaced by “jei” without much change in meaning:

**Example 11.7.6**

mi kucli le jei la frank. cu bebna *<kei>*  
I am curious about how true it is that Frank is a fool.

As a matter of convenience rather than logical necessity, “du’u” has been given an  $x_2$  place, which is a sentence (piece of language) expressing the bridi “ $_1$  is the predication (the bridi), expressed in sentence  $x_2$ ” and “le se du’u ...” is very useful in filling places of selbri which refer to speaking, writing, or other linguistic behavior regarding bridi:

**Example 11.7.7**

la djan. cusku le se du’u la djordj. klama le zarci *<kei>*  
 John expresses the sentence-expressing-that George goes-to the store  
 John says that George goes to the store.

Example 11.7.7 differs from

**Example 11.7.8**

la djan cusku lu la djordj. klama le zarci li’u  
 John expresses, quote, George goes to the store, unquote.  
 John says “George goes to the store”.

because Example 11.7.8 claims that John actually said the quoted words, whereas Example 11.7.7 claims only that he said some words or other which were to the same purpose.

“le se du’u” is much the same as “lu’e le du’u”, a symbol for the predication, but “se du’u” can be used as a selbri, whereas “lu’e” is ungrammatical in a selbri. (See Chapter 5 for a discussion of “lu’e”.)

## 11.8 Indirect questions

The following cmavo is discussed in this section:

**Definition 11.7**

*kau* indirect question marker

UI

There is an alternative type of sentence involving “du’u” and a selbri expressing a propositional attitude. In addition to sentences like

**Example 11.8.1**

I know that John went to the store.

we can also say things like

**Example 11.8.2**

I know who went to the store.

This form is called an *indirect question* in English because the embedded English sentence is a question: “Who went to the store?” A person who says Example 11.8.2 is claiming to know the answer to this question. Indirect questions can occur with many other English verbs as well: I can wonder, or doubt, or see, or hear, as well as know who went to the store.

To express indirect questions in Lojban, we use a “le du’u” abstraction, but rather than using a question word like “who” (“ma” in Lojban), we use any word that will fit grammatically and mark it with the suffix particle “kau”. This cmavo belongs to selma’o UI, so grammatically it can appear anywhere. The simplest Lojban translation of Example 11.8.2 is therefore:

**Example 11.8.3**

mi djuno le du'u makau pu klama le zarci  
 I know the predication-of  $x$  *<indirect question>* *<past>* going to the store.

In Example 11.8.3, we have chosen to use “ma” as the word marked by “kau”. In fact, any other sumti would have done as well: “zo’e” or “da” or even “la djan.”. Using “la djan.” would suggest that it was John who I knew had gone to the store, however:

**Example 11.8.4**

mi djuno le du'u la djan. kau pu klama le zarci  
 I know the predication-of/fact-that John *<indirect question>* *<past>* going to the store.  
 I know who went to the store, namely John.  
 I know that it was John who went to the store.

Using one of the indefinite pro-sumti such as “ma”, “zo’e”, or “da” does not suggest any particular value.

Why does Lojban require the “kau” marker, rather than using “ma” as English and Chinese and many other languages do? Because “ma” always signals a direct question, and so

**Example 11.8.5**

mi djuno le du'u ma pu klama le zarci  
 I know the predication-of *<what sumti?>* *<past>* goes-to the store

means

**Example 11.8.6**

Who is it that I know goes to the store?

It is actually not necessary to use “le du'u” and “kau” at all if the indirect question involves a sumti; there is generally a paraphrase of the type:

**Example 11.8.7**

mi djuno fi le pu klama be le zarci  
 I know about the *<past>* goer to-the store.  
 I know something about the one who went to the store (namely, his identity).

because the  $x_3$  place of “djuno” is the subject of knowledge, as opposed to the fact that is known. But when the questioned point is not a sumti, but (say) a logical connection, then there is no good alternative to “kau”:

**Example 11.8.8**

mi ba zgana le du'u la djan. jikau la djordj. cu zvati le panku  
 I *<future>* observe the predication-of/fact-that John *<connective indirect question>* George is-at the park.  
 I will see whether John or George (or both) is at the park.

In addition, Example 11.8.7 is only a loose paraphrase of Example 11.8.3, because it is left to the listener’s insight to realize that what is known about the goer-to-the-store is his identity rather than some other of his attributes.

## 11.9 Minor abstraction types

The following cmavo are discussed in this section:

### Definition 11.8

<i>li'i</i>	experience abstractor	<i>NU</i>
<i>si'o</i>	concept abstractor	<i>NU</i>
<i>su'u</i>	general abstractor	<i>NU</i>

There are three more abstractors in Lojban, all of them little used so far. The abstractor “li'i” expresses experience:

### Example 11.9.1

mi morji le li'i mi verba  
I remember the experience-of (my being-a-child)

The abstractor “si'o” expresses a mental image, a concept, an idea:

### Example 11.9.2

mi nelci le si'o la lojban. cu mulno  
I enjoy the concept-of Lojban being-complete.

Finally, the abstractor “su'u” is a vague abstractor, whose meaning must be grasped from context:

### Example 11.9.3

ko zgana le su'u le ci smacu cu bajra  
you (*imperative*) observe the abstract-nature-of the three mice running  
See how the three mice run!

All three of these abstractors have an  $x_2$  place. An experience requires an experiencer, so the place structure of “li'i” is: “ $x_1$  is the experience of (the bridi) as experienced by  $x_2$ ”. Similarly, an idea requires a mind to hold it, so the place structure of “si'o” is “ $x_1$  is the idea/concept of (the bridi) in the mind of  $x_2$ ”. Finally, there needs to be some way of specifying just what sort of abstraction “su'u” is representing, so its place structure is “ $x_1$  is an abstract nature of (the bridi) of type  $x_2$ ”.

The  $x_2$  place of “su'u” allows it to serve as a substitute for any of the other abstractors, or as a template for creating new ones. For example,

### Example 11.9.4

le nu mi klama  
the event-of my going

can be paraphrased as

### Example 11.9.5

le su'u mi klama kei be lo fasnu  
the abstract-nature-of (my going) of-type an event

and there is a book whose title might be rendered in Lojban as:

**Example 11.9.6**

le su'u la .iecuas. kuctra selcatra kei be lo sao'rdzifa'a ke nalmatma'e sutyterjvi  
 the abstract-nature-of (Jesus is-an-intersect-shape type-of-killed-one) of-type a slope-  
 low-direction type-of non-motor-vehicle speed-competition  
 The Crucifixion of Jesus Considered As A Downhill Bicycle Race

Note the importance of using “kei” after “su'u” when the  $x_2$  of “su'u” (or any other abstraction) is being specified; otherwise, the “be lo” ends up inside the abstraction bridi.

## 11.10 Lojban sumti raising

The following cmavo are discussed in this section:

**Definition 11.9**

<i>tu'a</i>	an abstraction involving	<i>LAhE</i>
<i>jai</i>	abstraction conversion	<i>JAI</i>

It is sometimes inconvenient, in a situation where an abstract description is logically required, to express the abstraction. In English we can say:

**Example 11.10.1**

I try to open the door.

which in Lojban is:

**Example 11.10.2**

mi troci le nu <mi> gasnu le nu le vorme cu karbi'o  
 I try the event-of (I am-agent-in the event-of (the door open-becomes)).

which has an abstract description within an abstract description, quite a complex structure. In English (but not in all other languages), we may also say:

**Example 11.10.3**

I try the door.

where it is understood that what I try is actually not the door itself, but the act of opening it. The same simplification can be done in Lojban, but it must be marked explicitly using a cmavo. The relevant cmavo is “tu'a”, which belongs to selma'o LAhE. The Lojban equivalent of Example 11.10.3 is:

**Example 11.10.4**

mi troci tu'a le vorme  
 I try some-action-to-do-with the door.

The term “sumti-raising”, as in the title of this section, signifies that a sumti which logically belongs within an abstraction (or even within an abstraction which is itself inside an intermediate abstraction) is “raised” to the main bridi level. This transformation from Example 11.10.2

to Example 11.10.4 loses information: nothing except convention tells us what the abstraction was.

Using “tu’a” is a kind of laziness: it makes speaking easier at the possible expense of clarity for the listener. The speaker must be prepared for the listener to respond something like:

**Example 11.10.5**

tu’a le vorme lu’u ki’a  
something-to-do-with the door *<terminator>* *<confusion!>*

which indicates that “tu’a le vorme” cannot be understood. (The terminator for “tu’a” is “lu’u”, and is used in Example 11.10.5 to make clear just what is being questioned: the sumti-raising, rather than the word “vorme” as such.) An example of a confusing raised sumti might be:

**Example 11.10.6**

tu’a la djan. cu cafne  
something-to-do-with John frequently-occurs

This must mean that something which John does, or which happens to John, occurs frequently: but without more context there is no way to figure out what. Note that without the “tu’a”, Example 11.10.6 would mean that John considered as an event frequently occurs — in other words, that John has some sort of on-and-off existence! Normally we do not think of people as events in English, but the  $x_1$  place of “cafne” is an event, and if something that does not seem to be an event is put there, the Lojbanic listener will attempt to construe it as one. (Of course, this analysis assumes that “djan.” is the name of a person, and not the name of some event.)

Logically, a counterpart of some sort is needed to “tu’a” which transposes an abstract sumti into a concrete one. This is achieved at the selbri level by the cmavo “jai” (of selma’o JAI). This cmavo has more than one function, discussed in Chapter 9 and Chapter 11; for the purposes of this chapter, it operates as a conversion of selbri, similarly to the cmavo of selma’o SE. This conversion changes

**Example 11.10.7**

tu’a mi rinka le nu do morsi  
something-to-do-with me causes the event-of you are-dead  
My action causes your death.

into

**Example 11.10.8**

mi jai rinka le nu do morsi  
I am-associated-with causing the event-of your death.  
I cause your death.

In English, the subject of “cause” can either be the actual cause (an event), or else the agent of the cause (a person, typically); not so in Lojban, where the  $x_1$  of “rinka” is always an event. Example 11.10.7 and Example 11.10.8 look equally convenient (or inconvenient), but in making descriptions, Example 11.10.8 can be altered to:

**Example 11.10.9**

le jai rinka be le nu do morsi  
 that-which-is associated-with causing (the event-of your death)  
 the one who caused your death

because “jai” modifies the selbri and can be incorporated into the description — not so for “tu’a”.

The weakness of “jai” used in descriptions in this way is that it does not specify which argument of the implicit abstraction is being raised into the  $x_1$  place of the description selbri. One can be more specific by using the modal form of “jai” explained in Chapter 9:

**Example 11.10.10**

le jai gau rinka be le nu do morsi  
 that-which-is agent-in causing (the event-of your death)

## 11.11 Event-type abstractors and event contour tenses

This section is a logical continuation of Section 11.3.

There exists a relationship between the four types of events explained in Section 11.3 and the event contour tense cmavo of selma’o ZAhO. The specific cmavo of NU and of ZAhO are mutually interdefining; the ZAhO contours were chosen to fit the needs of the NU event types and vice versa. Event contours are explained in full in Chapter 10, and only summarized here.

The purpose of ZAhO cmavo is to represent the natural portions of an event, such as the beginning, the middle, and the end. They fall into several groups:

1. The cmavo “pu’o”, “ca’o”, and “ba’o” represent spans of time: before an event begins, while it is going on, and after it is over, respectively.
2. The cmavo “co’a”, “de’a”, “di’a”, and “co’u” represent points of time: the start of an event, the temporary stopping of an event, the resumption of an event after a stop, and the end of an event, respectively. Not all events can have breaks in them, in which case “de’a” and “di’a” do not apply.
3. The cmavo “mo’u” and “za’o” correspond to “co’u” and “ba’o” respectively, in the case of those events which have a natural ending point that may not be the same as the actual ending point: “mo’u” refers to the natural ending point, and “za’o” to the time between the natural ending point and the actual ending point (the “excessive” or “superfactive” part of the event).
4. The cmavo “co’i” represents an entire event considered as a point-event or achievement.
5. All these cmavo are applicable to events seen as processes and abstracted with “pu’u”. Only processes have enough internal structure to make all these points and spans of time meaningful.
6. For events seen as states and abstracted with “za’i”, the meaningful event contours are the spans “pu’o”, “ca’o”, and “ba’o”; the starting and ending points “co’a” and “co’u”, and the achievement contour “co’i”. States do not have natural endings distinct from their actual ending. (It is an open question whether states can be stopped and resumed.)

For events seen as activities and abstracted with “zu’o”, the meaningful event contours are the spans “pu’o”, “ca’o”, and “ba’o”, and the achievement contour “co’i”. Because activities are inherently cyclic and repetitive, the beginning and ending points are not well-defined: you do not know whether an activity has truly begun until it begins to repeat.

For events seen as point-events and abstracted with “mu’e”, the meaningful event contours are the spans “pu’o” and “ba’o” but not “ca’o” (a point-event has no duration), and the achievement contour “co’i”.

Note that the parts of events are themselves events, and may be treated as such. The points in time may be seen as “mu’e” point-events; the spans of time may constitute processes or activities. Therefore, Lojban allows us to express processes within processes, activities within states, and many other complicated abstract things.

## 11.12 Abstractor connection

An abstractor may be replaced by two or more abstractors joined by logical or non-logical connectives. Connectives are explained in detail in Chapter 14. The connection can be expanded to one between two bridi which differ only in abstraction marker. Example 11.13.1 and Example 11.13.2 are equivalent in meaning:

### Example 11.12.1

le ka la frank. ciska cu xlali  
 .ije le ni la frank. ciska cu xlali  
 The quality-of Frank’s writing is bad,  
 and the quantity of Frank’s writing is bad.

### Example 11.12.2

le ka je ni la frank. ciska cu xlali  
 The quality and quantity of Frank’s writing is bad.

This feature of Lojban has hardly ever been used, and nobody knows what uses it may eventually have.

## 11.13 Table of abstractors

The following table gives each abstractor, an English gloss for it, a Lojban gismu which is connected with it (more or less remotely: the associations between abstractors and gismu are meant more as memory hooks than for any kind of inference), the rafsi associated with it, and (on the following line) its place structure.

### Definition 11.10

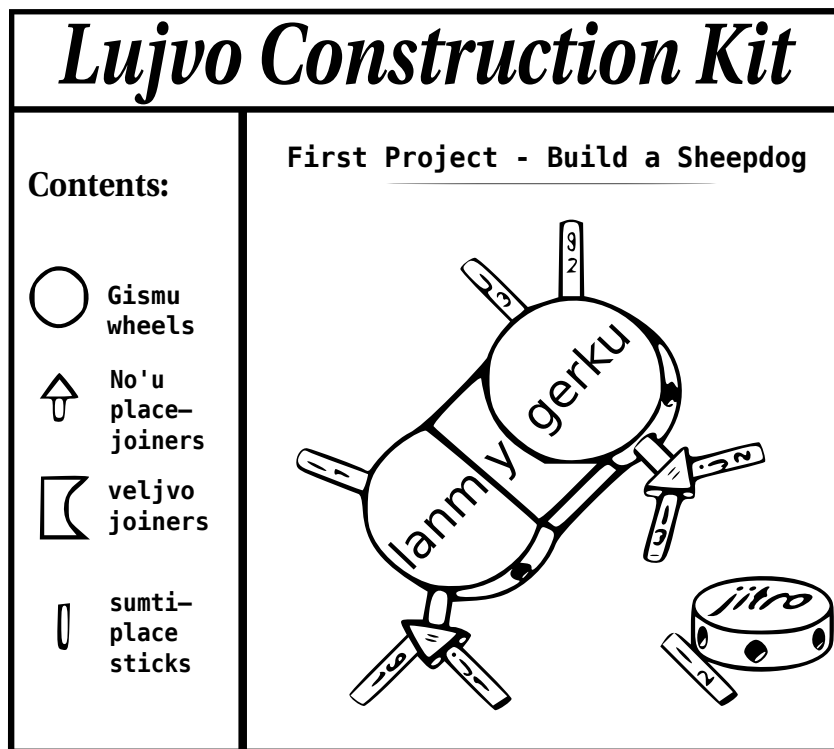
<i>nu</i>	event of	fasnu	nun	$x_1$ is an event of (the bridi)
<i>ka</i>	property of	ckaji	kam	$x_1$ is a property of (the bridi)
<i>ni</i>	amount of	klani	nil	$x_1$ is an amount of (the bridi) measured on scale $x_2$
<i>jei</i>	truth-value of	jetnu	jez	$x_1$ is a truth-value of (the bridi) under epistemology $x_2$



<i>li'i</i>	experience of	lifri	liz	$x_1$ is an experience of (the bridi) to experiencer $x_2$
<i>si'o</i>	idea of	sidbo	siz	$x_1$ is an idea/concept of (the bridi) in the mind of $x_2$
<i>du'u</i>	predication of		dum	$x_1$ is the bridi (the bridi) expressed by sentence $x_2$
<i>su'u</i>	abstraction of	sucta	sus	$x_1$ is an abstract nature of (the bridi)
<i>za'i</i>	state of	zasti	zam	$x_1$ is a state of (the bridi)
<i>zu'o</i>	activity of	zakte	zum	$x_1$ is an activity of (the bridi)
<i>pu'u</i>	process of	pruce	pup	$x_1$ is a process of (the bridi)
<i>mu'e</i>	point-event of	mulno	mub	$x_1$ is a point-event/achievement of (the bridi)



## Dog House and White House: Determining *lujvo* Place Structures



### 12.1 Why have *lujvo*?

The Lojban vocabulary is founded on its list of 1350-plus gismu, made up by combining word lists from various sources. These gismu are not intended to be either a complete vocabulary for the language nor a minimal list of semantic primitives. Instead, the gismu list serves as a basis for the creation of compound words, or *lujvo*. The intention is that (except in certain semantically broad but shallow fields such as cultures, nations, foods, plants, and animals) suitable

*lujvo* can be devised to cover the ten million or so concepts expressible in all the world's languages taken together. Grammatically, *lujvo* behave just like *gismu*: they have place structures and function as *selbri*.

There is a close relationship between *lujvo* and *tanru*. In fact, *lujvo* are condensed forms of *tanru*:

**Example 12.1.1**

ti fagri festi  
That is-fire waste.

contains a *tanru* which can be reduced to the *lujvo* in:

**Example 12.1.2**

ti fagyfesti  
That is-fire-waste.  
That is-ashes.

Although the *lujvo* “*fagyfesti*” is derived from the *tanru* “*fagri festi*”, it is not equivalent in meaning to it. In particular, “*fagyfesti*” has a distinct place structure of its own, not the same as that of “*festi*”. (In contrast, the *tanru* does have the same place structure as “*festi*”.) The *lujvo* needs to take account of the places of “*fagri*” as well. When a *tanru* is made into a *lujvo*, there is no equivalent of “*be ... bei ... be'o*” (described in Chapter 5) to incorporate *sumti* into the middle of the *lujvo*.

So why have *lujvo*? Primarily to reduce semantic ambiguity. On hearing a *tanru*, there is a burden on the listener to figure out what the *tanru* might mean. Adding further terms to the *tanru* reduces ambiguity in one sense, by providing more information; but it increases ambiguity in another sense, because there are more and more *tanru* joints, each with an ambiguous significance. Since *lujvo*, like other *brivla*, have a fixed place structure and a single meaning, encapsulating a commonly-used *tanru* into a *lujvo* relieves the listener of the burden of creative understanding. In addition, *lujvo* are typically shorter than the corresponding *tanru*.

There are no absolute laws fixing the place structure of a newly created *lujvo*. The maker must consider the place structures of all the components of the *tanru* and then decide which are still relevant and which can be removed. What is said in this chapter represents guidelines, presented as one possible standard, not necessarily complete, and not the only possible standard. There may well be *lujvo* that are built without regard for these guidelines, or in accordance with entirely different guidelines, should such alternative guidelines someday be developed. The reason for presenting any guidelines at all is so that *Lojbanists* have a starting point for deciding on a likely place structure — one that others seeing the same word can also arrive at by similar consideration.

If the *tanru* includes connective *cmavo* such as “*bo*”, “*ke*”, “*ke'e*”, or “*je*”, or conversion or abstraction *cmavo* such as “*se*” or “*nu*”, there are ways of incorporating them into the *lujvo* as well. Sometimes this makes the *lujvo* excessively long; if so, the *cmavo* may be dropped. This leads to the possibility that more than one *tanru* could produce the same *lujvo*. Typically, however, only one of the possible *tanru* is useful enough to justify making a *lujvo* for it.

The exact workings of the *lujvo*-making algorithm, which takes a *tanru* built from *gismu* (and possibly *cmavo*) and produces a *lujvo* from it, are described in Chapter 4.

## 12.2 The meaning of tanru: a necessary detour

The meaning of a *lujvo* is controlled by — but is not the same as — the meaning of the *tanru* from which the *lujvo* was constructed. The *tanru* corresponding to a *lujvo* is called its *veljvo* in Lojban, and since there is no concise English equivalent, that term will be used in this chapter. Furthermore, the left (modifier) part of a *tanru* will be called the *seltau*, and the right (modified) part the *tertau*, following the usage of Chapter 5. For brevity, we will speak of the *seltau* or *tertau* of a *lujvo*, meaning of course the *seltau* or *tertau* of the *veljvo* of that *lujvo*. (If this terminology is confusing, substituting “modifier” for “seltau” and “modified” for “tertau” may help.)

The place structure of a *tanru* is always the same as the place structure of its *tertau*. As a result, the meaning of the *tanru* is a modified version of the meaning of the *tertau*; the *tanru* will typically, but not always, refer to a subset of the things referred to by the *tertau*.

The purpose of a *tanru* is to join concepts together without necessarily focusing on the exact meaning of the *seltau*. For example, in the *Iliad*, the poet talks about “the wine-dark sea”, in which “wine” is a *seltau* relative to “dark”, and the pair of words is a *seltau* relative to “sea”. We’re talking about the sea, not about wine or color. The other words are there to paint a scene in the listener’s mind, in which the real action will occur, and to evoke relations to other sagas of the time similarly describing the sea. Logical inferences about wine or color will be rejected as irrelevant.

As a simple example, consider the rather non-obvious *tanru* “klama zdani”, or “goer-house”. The *gismu* “zdani” has two places:

### Example 12.2.1

$x_1$  is a nest/house/lair/den for inhabitant  $x_2$

(but in this chapter we will use simply “house”, for brevity), and the *gismu* “klama” has five:

### Example 12.2.2

$x_1$  goes to destination  $x_2$  from origin point  $x_3$  via route  $x_4$  using means  $x_5$

The *tanru* “klama zdani” will also have two places, namely those of “zdani”. Since a “klama zdani” is a type of “zdani”, we can assume that all goer-houses — whatever they may be — are also houses.

But is knowing the places of the *tertau* everything that is needed to understand the meaning of a *tanru*? No. To see why, let us switch to a less unlikely *tanru*: “gerku zdani”, literally “dog house”. A *tanru* expresses a very loose relation: a “gerku zdani” is a house that has something to do with some dog or dogs. What the precise relation might be is left unstated. Thus, the meaning of “lo gerku zdani” can include all of the following: houses occupied by dogs, houses shaped by dogs, dogs which are also houses (e.g. houses for fleas), houses named after dogs, and so on. All that is essential is that the place structure of “zdani” continues to apply.

For something (call it  $z_1$ ) to qualify as a “gerku zdani” in Lojban, it’s got to be a house, first of all. For it to be a house, it’s got to house someone (call that  $z_2$ ). Furthermore, there’s got to be a dog somewhere (called  $g_1$ ). For  $g_1$  to count as a dog in Lojban, it’s got to belong to some breed as well (called  $g_2$ ). And finally, for  $z_1$  to be in the first place of “gerku zdani”, as opposed to just “zdani”, there’s got to be some relationship (called  $r$ ) between some place of “zdani” and some place of “gerku”. It doesn’t matter which places, because if there’s a relationship between some place of “zdani” and any place of “gerku”, then that relationship can be compounded with the relationship between the places of “gerku” — namely, “gerku” itself — to reach any

of the other “gerku” places. Thus, if the relationship turns out to be between  $z_2$  and  $g_2$ , we can still state  $r$  in terms of  $z_1$  and  $g_1$ : “the relationship involves the dog  $g_1$ , whose breed has to do with the occupant of the house  $z_1$ ”.

Doubtless to the relief of the reader, here’s an illustration. We want to find out whether the White House (the one in which the U. S. President lives, that is) counts as a “gerku zdani”. We go through the five variables. The White House is the  $z_1$ . It houses Bill Clinton as  $z_2$ , as of this writing, so it counts as a “zdani”. Let’s take a dog — say, Spot ( $g_1$ ). Spot has to have a breed; let’s say it’s a Saint Bernard ( $g_2$ ). Now, the White House counts as a “gerku zdani” if there is any relationship  $r$  at all between the White House and Spot. (We’ll choose the  $g_1$  and  $z_1$  places to relate by  $r$ ; we could have chosen any other pair of places, and simply gotten a different relationship.)

The sky is the limit for  $r$ ; it can be as complicated as “The other day,  $g_1$  (Spot) chased Socks, who is owned by Chelsea Clinton, who is the daughter of Bill Clinton, who lives in  $z_1$  (the White House)” or even worse. If no such  $r$  can be found, well, you take another dog, and keep going until no more dogs can be found. Only then can we say that the White House cannot fit into the first place of “gerku zdani”.

As we have seen, no less than five elements are involved in the definition of “gerku zdani”: the house, the house dweller, the dog, the dog breed (everywhere a dog goes in Lojban, a dog breed follows), and the relationship between the house and the dog. Since tanru are explicitly ambiguous in Lojban, the relationship  $r$  cannot be expressed within a tanru (if it could, it wouldn’t be a tanru any more!) All the other places, however, can be expressed — thus:

**Example 12.2.3**

la blabi zdani cu gerku be fa la spot. bei la sankt. berNARD. be’o zdani la bil. kinton.  
The White House is-a-dog (namely Spot of-breed Saint Bernard) type-of-house-for Bill Clinton.

Not the most elegant sentence ever written in either Lojban or English. Yet if there is any relation at all between Spot and the White House, Example 12.2.3 is arguably true. If we concentrate on just one type of relation in interpreting the tanru “gerku zdani”, then the meaning of “gerku zdani” changes. So if we understand “gerku zdani” as having the same meaning as the English word “doghouse”, the White House would no longer be a “gerku zdani” with respect to Spot, because as far as we know Spot does not actually live in the White House, and the White House is not a doghouse (derogatory terms for incumbents notwithstanding).

## 12.3 The meaning of *lujvo*

This is a fairly long way to go to try and work out how to say “doghouse”! The reader can take heart; we’re nearly there. Recall that one of the components involved in fixing the meaning of a tanru — the one left deliberately vague — is the precise relation between the tertau and the seltau. Indeed, fixing this relation is tantamount to giving an interpretation to the ambiguous tanru.

A *lujvo* is defined by a single disambiguated instance of a tanru. That is to say, when we try to design the place structure of a *lujvo*, we don’t need to try to discover the relation between the tertau and the seltau. We already know what kind of relation we’re looking for; it’s given by the specific need we wish to express, and it determines the place structure of the *lujvo* itself.

Therefore, it is generally not appropriate to simply devise *lujvo* and decide on place structures for them without considering one or more specific usages for the coinage. If one does

not consider specifics, one will be likely to make erroneous generalizations on the relationship  $r$ .

The insight driving the rest of this chapter is this: while the relation expressed by a tanru can be very distant (e.g. Spot chasing Socks, above), the relationship singled out for disambiguation in a lujvo should be quite close. This is because lujvo-making, paralleling natural language compounding, picks out the most salient relationship  $r$  between a tertau place and a seltau place to be expressed in a single word. The relationship “dog chases cat owned by daughter of person living in house” is too distant, and too incidental, to be likely to need expression as a single short word; the relationship “dog lives in house” is not. From all the various interpretations of “gerku zdani”, the person creating “gerzda” should pick the most useful value of  $r$ . The most useful one is usually going to be the most obvious one, and the most obvious one is usually the closest one.

In fact, the relationship will almost always be so close that the predicate expressing  $r$  will be either the seltau or the tertau predicate itself. This should come as no surprise, given that a word like “zdani” in Lojban is a predicate. Predicates express relations; so when you’re looking for a relation to tie together “le zdani” and “le gerku”, the most obvious relation to pick is the very relation named by the tertau, “zdani”: the relation between a home and its dweller. As a result, the object which fills the first place of “gerku” (the dog) also fills the second place of “zdani” (the house-dweller).

The seltau-tertau relationship in the veljvo is expressed by the seltau or tertau predicate itself. Therefore, at least one of the seltau places is going to be equivalent to a tertau place. This place is thus redundant, and can be dropped from the place structure of the lujvo. As a corollary, the precise relationship between the veljvo components can be implicitly determined by finding one or more places to overlap in this way.

So what is the place structure of “gerzda”? We’re left with three places, since the dweller, the “se zdani”, turned out to be identical to the dog, the “gerku”. We can proceed as follows: (The notation introduced casually in Section 12.2 will be useful in the rest of this chapter. Rather than using the regular  $x_1$ ,  $x_2$ , etc. to represent places, we’ll use the first letter of the relevant gismu in place of the  $x$ , or more than one letter where necessary to resolve ambiguities. Thus,  $z_1$  is the first place of “zdani”, and  $g_2$  is the second place of “gerku”.)

The place structure of “zdani” is given as Example 12.2.1, but is repeated here using the new notation:

**Example 12.3.1**

$z_1$  is a nest/house/lair/den of  $z_2$

The place structure of “gerku” is:

**Example 12.3.2**

$g_1$  is a dog of breed  $g_2$

But  $z_2$  is the same as  $g_1$ ; therefore, the tentative place structure for “gerzda” now becomes:

**Example 12.3.3**

$z_1$  is a house for dweller  $z_2$  of breed  $g_2$

which can also be written:

**Example 12.3.4**

$z_1$  is a house for dog  $g_1$  of breed  $g_2$

or more concisely:

**Example 12.3.5**

$z_1$  is a house for dweller/dog  $z_2 = g_1$  of breed  $g_2$

Despite the apparently conclusive nature of Example 12.3.5, our task is not yet done: we still need to decide whether any of the remaining places should also be eliminated, and what order the lujvo places should appear in. These concerns will be addressed in the remainder of the chapter; but we are now equipped with the terminology needed for those discussions.

## 12.4 Selecting places

The set of places of an ordinary lujvo are selected from the places of its component gismu. More precisely, the places of such a lujvo are derived from the set of places of the component gismu by eliminating unnecessary places, until just enough places remain to give an appropriate meaning to the lujvo. In general, including a place makes the concept expressed by a lujvo more general; excluding a place makes the concept more specific, because omitting the place requires assuming a standard value or range of values for it.

It would be possible to design the place structure of a lujvo from scratch, treating it as if it were a gismu, and working out what arguments contribute to the notion to be expressed by the lujvo. There are two reasons arguing against doing so and in favor of the procedure detailed in this chapter.

The first is that it might be very difficult for a hearer or reader, who has no preconceived idea of what concept the lujvo is intended to convey, to work out what the place structure actually is. Instead, he or she would have to make use of a lujvo dictionary every time a lujvo is encountered in order to work out what a “se jbopli” or a “te klagau” is. But this would mean that, rather than having to learn just the 1300-odd gismu place structures, a Lojbanist would also have to learn myriads of lujvo place structures with little or no apparent pattern or regularity to them. The purpose of the guidelines documented in this chapter is to apply regularity and to make it conventional wherever possible.

The second reason is related to the first: if the veljvo of the lujvo has not been properly selected, and the places for the lujvo are formulated from scratch, then there is a risk that some of the places formulated may not correspond to any of the places of the gismu used in the veljvo of the lujvo. If that is the case — that is to say, if the lujvo places are not a subset of the veljvo gismu places — then it will be very difficult for the hearer or reader to understand what a particular place means, and what it is doing in that particular lujvo. This is a topic that will be further discussed in Section 12.14.

However, second-guessing the place structure of the lujvo is useful in guiding the process of subsequently eliminating places from the veljvo. If the Lojbanist has an idea of what the final place structure should look like, he or she should be able to pick an appropriate veljvo to begin with, in order to express the idea, and then to decide which places are relevant or not relevant to expressing that idea.



## 12.5 Symmetrical and asymmetrical *lujvo*

A common pattern, perhaps the most common pattern, of *lujvo*-making creates what is called a *symmetrical lujvo*. A symmetrical *lujvo* is one based on a *tanru* interpretation such that the first place of the *seltau* is equivalent to the first place of the *tertau*: each component of the *tanru* characterizes the same object. As an illustration of this, consider the *lujvo* “*balsoi*”: it is intended to mean “both great and a soldier” — that is, “great soldier”, which is the interpretation we would tend to give its *veljvo*, “*banli sonci*”. The underlying *gismu* place structures are:

### Definition 12.1

*banli*       $b_1$  is great in property  $b_2$  by standard  $b_3$   
*sonci*       $s_1$  is a soldier of army  $s_2$

In this case the  $s_1$  place of “*sonci*” is redundant, since it is equivalent to the  $b_1$  place of “*banli*”. Therefore the place structure of “*balsoi*” need not include places for both  $s_1$  and  $b_1$ , as they refer to the same thing. So the place structure of “*balsoi*” is at most

### Example 12.5.1

$b_1 = s_1$  is a great soldier of army  $s_2$  in property  $b_2$  by standard  $b_3$

Some symmetrical *veljvo* have further equivalent places in addition to the respective first places. Consider the *lujvo* “*tinju’i*”, “to listen” (“to hear attentively, to hear and pay attention”). The place structures of the *gismu* “*tirna*” and “*jundi*” are:

### Definition 12.2

*tirna*       $t_1$  listens to  $t_2$  against background noise  $t_3$   
*jundi*       $j_1$  pays attention to  $j_2$

and the place structure of the *lujvo* is:

### Example 12.5.2

$j_1 = t_1$  listens to  $j_2 = t_2$  against background noise  $t_3$

Why so? Because not only is the  $j_1$  place (the one who pays attention) equivalent to the  $t_1$  place (the hearer), but the  $j_2$  place (the thing paid attention to) is equivalent to the  $t_2$  place (the thing heard).

A substantial minority of *lujvo* have the property that the first place of the *seltau* (“*gerku*” in this case) is equivalent to a place other than the first place of the *tertau*; such *lujvo* are said to be “asymmetrical”. (There is a deliberate parallel here with the terms “asymmetrical *tanru*” and “symmetrical *tanru*” used in Chapter 5.)

In principle any asymmetrical *lujvo* could be expressed as a symmetrical *lujvo*. Consider “*gerzda*”, discussed in Section 12.3, where we learned that the  $g_1$  place was equivalent to the  $z_2$  place. In order to get the places aligned, we could convert “*zdani*” to “*se zdani*” (or “*selzda*” when expressed as a *lujvo*). The place structure of “*selzda*” is

### Example 12.5.3

$s_1$  is housed by nest  $s_2$

and so the three-part *lujvo* “gerselzda” would have the place structure

**Example 12.5.4**

$s_1 = g_1$  is a dog housed in nest  $s_2$  of dog breed  $g_2$

However, although “gerselzda” is a valid *lujvo*, it doesn’t translate “doghouse”; its first place is the dog, not the doghouse. Furthermore, it is more complicated than necessary; “gerzda” is simpler than “gerselzda”.

From the reader’s or listener’s point of view, it may not always be obvious whether a newly met *lujvo* is symmetrical or asymmetrical, and if the latter, what kind of asymmetrical *lujvo*. If the place structure of the *lujvo* isn’t given in a dictionary or elsewhere, then plausibility must be applied, just as in interpreting *tanru*.

The *lujvo* “karcykla”, for example, is based on “karce klama”, or “car goer”. The place structure of “karce” is:

**Example 12.5.5**

$ka_1$  is a car carrying  $ka_2$  propelled by  $ka_3$

A asymmetrical interpretation of “karcykla” that is strictly analogous to the place structure of “gerzda”, equating the *kl2* (destination) and  $ka_1$  (car) places, would lead to the place structure

**Example 12.5.6**

$kl_1$  goes to car  $kl_2 = ka_1$  which carries  $ka_2$  propelled by  $ka_3$  from origin  $kl_3$  via route  $kl_4$  by means of  $kl_5$

But in general we go about in cars, rather than going to cars, so a far more likely place structure treats the  $ka_1$  place as equivalent to the *kl5* place, leading to

**Example 12.5.7**

$kl_1$  goes to destination  $kl_2$  from origin  $kl_3$  via route  $kl_4$  by means of car  $kl_5 = ka_1$  carrying  $ka_2$  propelled by  $ka_3$ .

instead.

## 12.6 Dependent places

In order to understand which places, if any, should be completely removed from a *lujvo* place structure, we need to understand the concept of dependent places. One place of a *brivla* is said to be dependent on another if its value can be predicted from the values of one or more of the other places. For example, the  $g_2$  place of “gerku” is dependent on the  $g_1$  place. Why? Because when we know what fits in the  $g_1$  place (Spot, let us say, a well-known dog), then we know what fits in the  $g_2$  place (“St. Bernard”, let us say). In other words, when the value of the  $g_1$  place has been specified, the value of the  $g_2$  place is determined by it. Conversely, since each dog has only one breed, but each breed contains many dogs, the  $g_1$  place is not dependent on the  $g_2$  place; if we know only that some dog is a St. Bernard, we cannot tell by that fact alone which dog is meant.

For “zdani”, on the other hand, there is no dependency between the places. When we know the identity of a house-dweller, we have not determined the house, because a dweller may

dwell in more than one house. By the same token, when we know the identity of a house, we do not know the identity of its dweller, for a house may contain more than one dweller.

The rule for eliminating places from a *lujvo* is that dependent places provided by the *seltau* are eliminated. Therefore, in “gerzda” the dependent  $g_2$  place is removed from the tentative place structure given in Example 12.3.5, leaving the place structure:

**Example 12.6.1**

$z_1$  is the house dwelt in by dog  $z_2 = g_1$

Informally put, the reason this has happened — and it happens a lot with *seltau* places — is that the third place was describing not the doghouse, but the dog who lives in it. The sentence

**Example 12.6.2**

la mon. rePOS. gerzda la spat.  
Mon Repos is a doghouse of Spot.

really means

**Example 12.6.3**

la mon. rePOS. zdani la spat. noi gerku  
Mon Repos is a house of Spot, who is a dog.

since that is the interpretation we have given “gerzda”. But that in turn means

**Example 12.6.4**

la mon. rePOS. zdani la spat noi ke'a gerku zo'e  
Mon Repos is a house of Spot, who is a dog of unspecified breed.

Specifically,

**Example 12.6.5**

la mon. rePOS. zdani la spat. noi ke'a gerku la sankt. berNARD.  
Mon Repos is a house of Spot, who is a dog of breed St. Bernard.

and in that case, it makes little sense to say

**Example 12.6.6**

la mon. rePOS. gerzda la spat. noi ke'a gerku la sankt. berNARD. ku'o la sankt. berNARD.  
Mon Repos is a doghouse of Spot, who is a dog of breed St. Bernard, of breed St. Bernard.

employing the over-ample place structure of Example 12.3.5. The dog breed is redundantly given both in the main *selbri* and in the relative clause, and (intuitively speaking) is repeated in the wrong place, since the dog breed is supplementary information about the dog, and not about the doghouse.

As a further example, take “cackinki”, the *lujvo* for “beetle”, based on the *tanru* “calku cinki”, or “shell-insect”. The *gismu* place structures are:

**Definition 12.3**

*calku*      $ca_1$  is a shell/husk around  $ca_2$  made of  $ca_3$   
*cinki*      $ci_1$  is an insect/arthropod of species  $ci_2$

This example illustrates a cross-dependency between a place of one gismu and a place of the other. The  $ca_3$  place is dependent on  $ci_1$ , because all insects (which fit into  $ci_1$ ) have shells made of chitin (which fits into  $ca_3$ ). Furthermore,  $ca_1$  is dependent on  $ci_1$  as well, because each insect has only a single shell. And since  $ca_2$  (the thing with the shell) is equivalent to  $ci_1$  (the insect), the place structure is:

**Example 12.6.7**

$ci_1 = ca_2$  is a beetle of species  $ci_2$

with not a single place of “calku” surviving independently!

(Note that there is nothing in this explanation that tells us just why “calkcinki” means “beetle” (member of Coleoptera), since all insects in their adult forms have chitin shells of some sort. The answer, which is in no way predictable, is that the shell is a prominent, highly noticeable feature of beetles in particular.)

What about the dependency of  $ci_2$  on  $ci_1$ ? After all, no beetle belongs to more than one species, so it would seem that the  $ci_2$  place of “calkcinki” could be eliminated on the same reasoning that allowed us to eliminate the  $g_2$  place of “gerzda” above. However, it is a rule that dependent places are not eliminated from a lujvo when they are derived from the tertau of its veljvo. This rule is imposed to keep the place structures of lujvo from drifting too far from the tertau place structure; if a place is necessary in the tertau, it’s treated as necessary in the lujvo as well.

In general, the desire to remove places coming from the tertau is a sign that the veljvo selected is simply wrong. Different place structures imply different concepts, and the lujvo maker may be trying to shoehorn the wrong concept into the place structure of his or her choosing. This is obvious when someone tries to shoe-horn a “klama” tertau into a “litru” or “cliva” concept, for example: these gismu differ in their number of arguments, and suppressing places of “klama” in a lujvo doesn’t make any sense if the resulting modified place structure is that of “litru” or “cliva”.

Sometimes the dependency is between a single place of the tertau and the whole event described by the seltau. Such cases are discussed further in Section 12.13.

Unfortunately, not all dependent places in the seltau can be safely removed: some of them are necessary to interpreting the lujvo’s meaning in context. It doesn’t matter much to a dog-house what breed of dog inhabits it, but it can make quite a lot of difference to the construction of a school building what kind of school is in it! Music schools need auditoriums and recital rooms, elementary schools need playgrounds, and so on: therefore, the place structure of “kuldi’u” (from “ckule dinju”, and meaning “school building”) needs to be

**Example 12.6.8**

$d_1$  is a building housing school  $c_1$  teaching subject  $c_3$  to audience  $c_4$

even though  $c_3$  and  $c_4$  are plainly dependent on  $c_1$ . The other places of “ckule”, the location ( $c_2$ ) and operators ( $c_5$ ), don’t seem to be necessary to the concept “school building”, and are dependent on  $c_1$  to boot, so they are omitted. Again, the need for case-by-case consideration of place structures is demonstrated.

## 12.7 Ordering *lujvo* places.

So far, we have concentrated on selecting the places to go into the place structure of a *lujvo*. However, this is only half the story. In using *selbri* in Lojban, it is important to remember the right order of the *sumti*. With *lujvo*, the need to attend to the order of *sumti* becomes critical: the set of places selected should be ordered in such a way that a reader unfamiliar with the *lujvo* should be able to tell which place is which.

If we aim to make understandable *lujvo*, then, we should make the order of places in the place structure follow some conventions. If this does not occur, very real ambiguities can turn up. Take for example the *lujvo* “*jdaselsku*”, meaning “prayer”. In the sentence

### Example 12.7.1

di'e jdaselsku la dong.  
This-utterance is-a-prayer somehow-related-to-Dong.

we must be able to know if Dong is the person making the prayer, giving the meaning

### Example 12.7.2

This is a prayer by Dong

or is the entity being prayed to, resulting in

### Example 12.7.3

This is a prayer to Dong

We could resolve such problems on a case-by-case basis for each *lujvo* (Section 12.14 discusses when this is actually necessary), but case-by-case resolution for run-of-the-mill *lujvo* makes the task of learning *lujvo* place structures unmanageable. People need consistent patterns to make sense of what they learn. Such patterns can be found across *gismu* place structures (see Section 12.16), and are even more necessary in *lujvo* place structures. Case-by-case consideration is still necessary; *lujvo* creation is a subtle art, after all. But it is helpful to take advantage of any available regularities.

We use two different ordering rules: one for symmetrical *lujvo* and one for asymmetrical ones. A symmetrical *lujvo* like “*balsoi*” (from Section 12.5) has the places of its *tertau* followed by whatever places of the *seltau* survive the elimination process. For “*balsoi*”, the surviving places of “*banli*” are  $b_2$  and  $b_3$ , leading to the place structure:

### Example 12.7.4

$b_1 = s_1$  is a great soldier of army  $s_2$  in property  $b_2$  by standard  $b_3$

just what appears in Example 12.5.1. In fact, all place structures shown until now have been in the correct order by the conventions of this section, though the fact has been left tacit until now. The motivation for this rule is the parallelism between the *lujvo* *bridi*-schema:

### Example 12.7.5

$b_1$  *bansoi*  $s_2$   $b_2$   $b_3$   
 $b_1$  is-a-great-soldier of-army- $s_2$  in-property- $b_2$  by-standard- $b_3$

and the more or less equivalent *bridi*-schema

**Example 12.7.6**

$b_1$  sonci  $s_2$  gi'e banli  $b_2$   $b_3$   
 $b_1$  is-a-soldier of-army- $s_2$  and is-great in-property- $b_2$  by-standard- $b_3$

where “gi'e” is the Lojban word for “and” when placed between two partial bridi, as explained in Chapter 14.

Asymmetrical lujvo like “gerzda”, on the other hand, employ a different rule. The seltau places are inserted not at the end of the place structure, but rather immediately after the tertau place which is equivalent to the first place of the seltau. Consider “dalmikce”, meaning “veterinarian”: its veljvo is “danlu mikce”, or “animal doctor”. The place structures for those gismu are:

**Definition 12.4**

*danlu*  $d_1$  is an animal of species  $d_2$

mikce:  $m_1$  is a doctor to patient  $m_2$  for ailment  $m_3$  using treatment  $m_4$   
 and the lujvo place structure is:

**Example 12.7.7**

$m_1$  is a doctor for animal  $m_2 = d_1$  of species  $d_2$  for ailment  $m_3$  using treatment  $m_4$

Since the shared place is  $m_2 = d_1$ , the animal patient, the remaining seltau place  $d_2$  is inserted immediately after the shared place; then the remaining tertau places form the last two places of the lujvo.

## 12.8 lujvo with more than two parts.

The theory we have outlined so far is an account of lujvo with two parts. But often lujvo are made containing more than two parts. An example is “bavlamdei”, “tomorrow”: it is composed of the rafsi for “future”, “adjacent”, and “day”. How does the account we have given apply to lujvo like this?

The best way to approach such lujvo is to continue to classify them as based on binary tanru, the only difference being that the seltau or the tertau or both is itself a lujvo. So it is easiest to make sense of “bavlamdei” as having two components: “bavla'i”, “next”, and “djedi”. If we know or invent the lujvo place structure for the components, we can compose the new lujvo place structure in the usual way.

In this case, “bavla'i” is given the place structure:

**Example 12.8.1**

$b_1 = l_1$  is next after  $b_2 = l_2$

making it a symmetrical lujvo. We combine this with “djedi”, which has the place structure:

**Example 12.8.2**

duration  $d_1$  is  $d_2$  days long (default 1) by standard  $d_3$

While symmetrical lujvo normally put any trailing tertau places before any seltau places, the day standard is a much less important concept than the day the tomorrow follows, in the

definition of “bavlamdei”. This is an example of how the guidelines presented for selecting and ordering *lujvo* places are just that, not laws that must be rigidly adhered to. In this case, we choose to rank places in order of relative importance. The resulting place structure is:

**Example 12.8.3**

$d_1 = b_1 = l_1$  is a day following  $b_2 = l_2, d_2$  days later (default 1) by standard  $d_3$

Here is another example of a multi-part *lujvo*: “cladakyxa’i”, meaning “long-sword”, a specific type of medieval weapon. The *gismu* place structures are:

**Definition 12.5**

*clani*  $c_1$  is long in direction  $c_2$  by standard  $c_3$   
*dakfu*  $d_1$  is a knife for cutting  $d_2$  with blade made of  $d_3$

*xarci* :  $xa_1$  is a weapon for use against  $xa_2$  by wielder  $xa_3$

Since “cladakyxa’i” is a symmetrical *lujvo* based on “cladakfu *xarci*”, and “cladakfu” is itself a symmetrical *lujvo*, we can do the necessary analyses all at once. Plainly  $c_1$  (the long thing),  $d_1$  (the knife), and  $xa_1$  (the weapon) are all the same. Likewise, the  $d_2$  place (the thing cut) is the same as the  $xa_2$  place (the target of the weapon), given that swords are used to cut victims. Finally, the  $c_2$  place (direction of length) is always along the sword blade in a longsword, by definition, and so is dependent on  $c_1 = d_1 = xa_1$ . Adding on the places of the remaining *gismu* in right-to-left order we get:

**Example 12.8.4**

$xa_1 = d_1 = c_1$  is a long-sword for use against  $xa_2 = d_2$  by wielder  $xa_3$ , with a blade made of  $d_3$ , long measured by standard  $c_3$ .

If the last place sounds unimportant to you, notice that what counts legally as a “sword”, rather than just a “knife”, depends on the length of the blade (the cutoff point varies in different jurisdictions). This fifth place of “cladakyxa’i” may not often be explicitly filled, but it is still useful on occasion. Because it is so seldom important, it is best that it be last.

## 12.9 Eliding SE rafsi from seltau

It is common to form *lujvo* that omit the *rafsi* based on *cmavo* of *selma'o* SE, as well as other *cmavo* *rafsi*. Doing so makes *lujvo* construction for common or useful constructions shorter. Since it puts more strain on the listener who has not heard the *lujvo* before, the shortness of the word should not necessarily outweigh ease in understanding, especially if the *lujvo* refers to a rare or unusual concept.

Consider as an example the *lujvo* “ti’ifla”, from the *veljvo* “stidi flalu”, and meaning “bill, proposed law”. The *gismu* place structures are:

**Definition 12.6**

*stidi* agent  $st_1$  suggests idea/action  $st_2$  to audience  $st_3$   
*flalu*  $f_1$  is a law specifying  $f_2$  for community  $f_3$  under conditions  $f_4$  by lawgiver  $f_5$

This *lujvo* does not fit any of our existing molds: it is the second *seltau* place,  $st_2$ , that is equivalent to one of the *tertau* places, namely  $f_1$ . However, if we understand “ti’ifla” as an

abbreviation for the lujvo “selti’ifla”, then we get the first places of seltau and tertau lined up. The place structure of “selti’i” is:

**Definition 12.7**

*selti’i*      idea/action  $se_1$  is suggested by agent  $se_2$  to audience  $se_3$

Here we can see that  $se_1$  (what is suggested) is equivalent to  $f_1$  (the law), and we get a normal symmetrical lujvo. The final place structure is:

**Example 12.9.1**

$f_1 = se_1$  is a bill specifying  $f_2$  for community  $f_3$  under conditions  $f_4$  by suggester  $se_2$  to audience/lawgivers  $f_5 = se_3$

or, relabeling the places,

**Example 12.9.2**

$f_1 = st_2$  is a bill specifying  $f_2$  for community  $f_3$  under conditions  $f_4$  by suggester  $st_1$  to audience/lawgivers  $f_5 = st_3$

where the last place ( $st_3$ ) is probably some sort of legislature.

Abbreviated lujvo like “ti’ifla” are more intuitive (for the lujvo-maker) than their more explicit counterparts like “selti’ifla” (as well as shorter). They don’t require the coiner to sit down and work out the precise relation between the seltau and the tertau: he or she can just rattle off a rafsi pair. But should the lujvo get to the stage where a place structure needs to be worked out, then the precise relation does need to be specified. And in that case, such abbreviated lujvo form a trap in lujvo place ordering, since they obscure the most straightforward relation between the seltau and tertau. To give our lujvo-making guidelines as wide an application as possible, and to encourage analyzing the seltau-tertau relation in lujvo, lujvo like “ti’ifla” are given the place structure they would have with the appropriate SE added to the seltau.

Note that, with these lujvo, an interpretation requiring SE insertion is safe only if the alternatives are either implausible or unlikely to be needed as a lujvo. This may not always be the case, and Lojbanists should be aware of the risk of ambiguity.

## 12.10 Eliding SE rafsi from tertau

Eliding SE rafsi from tertau gets us into much more trouble. To understand why, recall that lujvo, following their veljvo, describe some type of whatever their tertau describe. Thus, “posy-dji” describes a type of “djica”, “gerzda” describes a type of “zdani”, and so on. What is certain is that “gerzda” does not describe a “se zdani” — it is not a word that could be used to describe an inhabitant such as a dog.

Now consider how we would translate the word “blue-eyed”. Let’s tentatively translate this word as “blakanla” (from “blanu kanla”, meaning “blue eye”). But immediately we are in trouble: we cannot say

**Example 12.10.1**

la djak. cu blakanla  
Jack is-a-blue-eye



because Jack is not an eye, “kanla”, but someone with an eye, “se kanla”. At best we can say

**Example 12.10.2**

la djak. cu se blakanla  
Jack is-the-bearer-of-blue-eyes

But look now at the place structure of “blakanla”: it is a symmetrical lujvo, so the place structure is:

**Example 12.10.3**

$x e_1 = s_1$  is a blue eye of  $x e_2 = s_2$

We end up being most interested in talking about the second place, not the first (we talk much more of people than of their eyes), so “se” would almost always be required.

What is happening here is that we are translating the tertau wrongly, under the influence of English. The English suffix “-eyed” does not mean “eye”, but someone with an eye, which is “selkanla”.

Because we’ve got the wrong tertau (eliding a “se” that really should be there), any attempt to accommodate the resulting lujvo into our guidelines for place structure is fitting a square peg in a round hole. Since they can be so misleading, lujvo with SE rafsi elided from the tertau should be avoided in favor of their more explicit counterparts: in this case, “blaselkanla”.

## 12.11 Eliding KE and KEhE rafsi from lujvo

People constructing lujvo usually want them to be as short as possible. To that end, they will discard any cmavo they regard as niceties. The first such cmavo to get thrown out are usually “ke” and “ke’e”, the cmavo used to structure and group tanru. We can usually get away with this, because the interpretation of the tertau with “ke” and “ke’e” missing is less plausible than that with the cmavo inserted, or because the distinction isn’t really important.

For example, in “bakrecca’o”, meaning “beefsteak”, the veljvo is

**Example 12.11.1**

⟨ke⟩ bakni rectu ⟨ke’e⟩ panlo  
(bovine meat) slice

because of the usual Lojban left-grouping rule. But there doesn’t seem to be much difference between that veljvo and

**Example 12.11.2**

bakni ke rectu panlo ⟨ke’e⟩  
bovine (meat slice)

On the other hand, the lujvo “zernerkla”, meaning “to sneak in”, almost certainly was formed from the veljvo

**Example 12.11.3**

zekri ke nenri klama ⟨ke’e⟩  
crime (inside go)  
to go within, criminally

because the alternative,

**Example 12.11.4**

$\langle ke \rangle$  zekri nenri  $\langle ke'e \rangle$  klama  
(crime inside) go

doesn't make much sense. (To go to the inside of a crime? To go into a place where it is criminal to be inside — an interpretation almost identical with Example 12.11.3 anyway?)

There are cases, however, where omitting a KE or KEhE rafsi can produce another lujvo, equally useful. For example, “xaskemcackurnu” means “oceanic shellfish”, and has the veljvo

**Example 12.11.5**

xamsi ke calku curnu  
ocean type-of (shell worm)

(“worm” in Lojban refers to any invertebrate), but “xascakcurnu” has the veljvo

**Example 12.11.6**

$\langle ke \rangle$  xamsi calku  $\langle ke'e \rangle$  curnu  
(ocean shell) type-of worm

and might refer to the parasitic worms that infest clamshells.

Such misinterpretation is more likely than not in a lujvo starting with *sel-* (from “se”), *nal-* (from “na’e”) or *tol-* (from “to’e”): the scope of the rafsi will likeliest be presumed to be as narrow as possible, since all of these cmavo normally bind only to the following brivla or “ke ... ke’e” group. For that reason, if we want to modify an entire lujvo by putting “se”, “na’e” or “to’e” before it, it’s better to leave the result as two words, or else to insert “ke”, than to just stick the SE or NAhE rafsi on.

It is all right to replace the phrase “se klama” with “selkla”, and the places of “selkla” are exactly those of “se klama”. But consider the related lujvo “dzukla”, meaning “to walk to somewhere”. It is a symmetrical lujvo, derived from the veljvo “cadzu klama” as follows:

**Definition 12.8**

<i>cadzu</i>	$c_1$ walks on surface $c_2$ using limbs $c_3$
<i>klama</i>	$k_1$ goes to $k_2$ from $k_3$ via route $k_4$ using $k_5$
<i>dzukla</i>	$c_1 = k_1$ walks to $k_2$ from $k_3$ via route $k_4$ using limbs $k_5 = c_3$ on surface $c_2$

We can swap the  $k_1$  and  $k_2$  places using “se dzukla”, but we cannot directly make “se dzukla” into “seldzukla”, which would represent the veljvo “selcadzu klama” and plausibly mean something like “to go to a walking surface”. Instead, we would need “selkemdzukla”, with an explicit rafsi for “ke”. Similarly, “nalbrablo” (from “na’e barda bloti”) means “non-big boat”, whereas “na’e brablo” means “other than a big boat”.

If the lujvo we want to modify with SE has a seltau already starting with a SE rafsi, we can take a shortcut. For instance, “gekmau” means “happier than”, while “selgekmau” means “making people happier than, more enjoyable than, more of a ‘se gleki’ than”. If something is less enjoyable than something else, we can say it is “se selgekmau”.

But we can also say it is “selselgekmau”. Two “se” cmavo in a row cancel each other (“se se gleki” means the same as just “gleki”), so there would be no good reason to have “selsel” in

a lujvo with that meaning. Instead, we can feel free to interpret *selse-* as *selkemsel-*. The rafsi combinations *terter-*, *velvel-* and *xelxel-* work in the same way.

Other SE combinations like *selter-*, although they might conceivably mean “se te”, more than likely should be interpreted in the same way, namely as “se ke te”, since there is no need to re-order places in the way that “se te” provides. (See Chapter 9.)

## 12.12 Abstract lujvo

The cmavo of NU can participate in the construction of lujvo of a particularly simple and well-patterned kind. Consider that old standard example, “klama”:

### Example 12.12.1

$k_1$  comes/goes to  $k_2$  from  $k_3$  via route  $k_4$  by means  $k_5$ .

The selbri “nu klama *<kei>*” has only one place, the event-of-going, but the full five places exist implicitly between “nu” and “kei”, since a full bridi with all sumti may be placed there. In a lujvo, there is no room for such inside places, and consequently the lujvo “nunkla” (*nun-* is the rafsi for “nu”), needs to have six places:

### Example 12.12.2

$nu_1$  is the event of  $k_1$ 's coming/going to  $k_2$  from  $k_3$  via route  $k_4$  by means  $k_5$ .

Here the first place of “nunklama” is the first and only place of “nu”, and the other five places have been pushed down by one to occupy the second through the sixth places. Full information on “nu”, as well as the other abstractors mentioned in this section, is given in Chapter 11.

For those abstractors which have a second place as well, the standard convention is to place this place after, rather than before, the places of the brivla being abstracted. The place structure of “nilkla”, the lujvo derived from “ni klama”, is the imposing:

### Example 12.12.3

$ni_1$  is the amount of  $k_1$ 's coming/going to  $k_2$  from  $k_3$  via route  $k_4$  by means  $k_5$ , measured on scale  $ni_2$ .

It is not uncommon for abstractors to participate in the making of more complex lujvo as well. For example, “nunsoidji”, from the veljvo

### Example 12.12.4

nu sonci kei djica  
event-of being-a-soldier desirer

has the place structure

### Example 12.12.5

$d_1$  desires the event of ( $s_1$  being a soldier of army  $s_2$ ) for purpose  $d_3$

where the  $d_2$  place has disappeared altogether, being replaced by the places of the seltau. As shown in Example 12.12.5, the ordering follows this idea of replacement: the seltau places are inserted at the point where the omitted abstraction place exists in the tertau.

The lujvo “nunsoidji” is quite different from the ordinary asymmetric lujvo “soidji”, a “soldier desirer”, whose place structure is just

**Example 12.12.6**

$d_1$  desires (a soldier of army  $s_2$ ) for purpose  $d_3$

A “nunsoidji” might be someone who is about to enlist, whereas a “soidji” might be a camp-follower.

One use of abstract lujvo is to eliminate the need for explicit “kei” in tanru: “nunkalri gasnu” means much the same as “nu kalri kei gasnu”, but is shorter. In addition, many English words ending in “-hood” are represented with *nun-* lujvo, and other words ending in “-ness” or “-dom” are often representable with *kam-* lujvo (*kam-* is the rafsi for “ka”); “kambla” is “blueness”.

Even though the cmavo of NU are long-scope in nature, governing the whole following bridi, the NU rafsi should generally be used as short-scope modifiers, like the SE and NAhE rafsi discussed in Section 12.9.

There is also a rafsi for the cmavo “jai”, namely *jax*, which allows sentences like

**Example 12.12.7**

mi jai rinka le nu do morsi  
I am-associated-with causing the event-of your death.  
I cause your death.

explained in Chapter 11, to be rendered with lujvo:

**Example 12.12.8**

mi jaxri'a le nu do morsi  
I am-part-of-the-cause-of the event-of your dying.

In making a lujvo that contains *jax-* for a selbri that contains “jai”, the rule is to leave the “fai” place as a “fai” place of the lujvo; it does not participate in the regular lujvo place structure. (The use of “fai” is also explained in Chapter 11.)

## 12.13 Implicit-abstraction lujvo

Eliding NU rafsi involves the same restrictions as eliding SE rafsi, plus additional ones. In general, NU rafsi should not be elided from the tertau, since that changes the kind of thing the lujvo is talking about from an abstraction to a concrete sumti. However, they may be elided from the seltau if no reasonable ambiguity would result.

A major difference, however, between SE elision and NU elision is that the former is a rather sparse process, providing a few convenient shortenings. Eliding “nu”, however, is extremely important in producing a class of lujvo called *implicit-abstraction lujvo*.

Let us make a detailed analysis of the lujvo “nunctikezgau”, meaning “to feed”. (If you think this lujvo is excessively longwinded, be patient.) The veljvo of “nunctikezgau” is “nu citka kei gasnu”. The relevant place structures are:

**Definition 12.9**

*nu*       $n_1$  is an event

<i>citka</i>	$c_1$ eats $c_2$
<i>gasnu</i>	$g_1$ does action/is the agent of event $g_2$

In accordance with the procedure for analyzing three-part *lujvo* given in Section 12.8, we will first create an intermediate *lujvo*, “nuncti”, whose *veljvo* is “nu *citka* [kei]”. By the rules given in Section 12.12, “nuncti” has the place structure

**Example 12.13.1**

$n_1$  is the event of  $c_1$  eating  $c_2$

Now we can transform the *veljvo* of “nunctikezgau” into “nuncti *gasnu*”. The  $g_2$  place (what is brought about by the actor  $g_1$ ) obviously denotes the same thing as  $n_1$  (the event of eating). So we can eliminate  $g_2$  as redundant, leaving us with a tentative place structure of

**Example 12.13.2**

$g_1$  is the actor in the event  $n_1 = g_2$  of  $c_1$  eating  $c_2$

But it is also possible to omit the  $n_1$  place itself! The  $n_1$  place describes the event brought about; an event in Lojban is described as a *bridi*, by a *selbri* and its *sumti*; the *selbri* is already known (it’s the *seltau*), and the *sumti* are also already known (they’re in the *lujvo* place structure). So  $n_1$  would not give us any information we didn’t already know. In fact, the  $n_1 = g_2$  place is dependent on  $c_1$  and  $c_2$  jointly — it does not depend on either  $c_1$  or  $c_2$  by itself. Being dependent and derived from the *seltau*, it is omissible. So the final place structure of “nunctikezgau” is:

**Example 12.13.3**

$g_1$  is the actor in the event of  $c_1$  eating  $c_2$

There is one further step that can be taken. As we have already seen with “*balsoi*” in Section 12.5, the interpretation of *lujvo* is constrained by the semantics of *gismu* and of their *sumti* places. Now, any asymmetrical *lujvo* with “*gasnu*” as its *tertau* will involve an event abstraction either implicitly or explicitly, since that is how the  $g_2$  place of “*gasnu*” is defined.

Therefore, if we assume that “nu” is the type of abstraction one would expect to be a “*se gasnu*”, then the *rafsi* “*nun*” and “*kez*” in “nunctikezgau” are only telling us what we would already have guessed — that the *seltau* of a “*gasnu*” *lujvo* is an event. If we drop these *rafsi* out, and use instead the shorter *lujvo* “*ctigau*”, rejecting its symmetrical interpretation (“someone who both does and eats”; “an eating doer”), we can still deduce that the *seltau* refers to an event.

(You can’t “do an eater”/“*gasnu lo citka*”, with the meaning of “do” as “bring about an event”; so the *seltau* must refer to an event, “nu *citka*”. The English slang meanings of “do someone”, namely “socialize with someone” and “have sex with someone”, are not relevant to “*gasnu*”.)

So we can simply use “*ctigau*” with the same place structure as “nunctikezgau”:

**Example 12.13.4**

agent  $g_1$  causes  $c_1$  to eat  $c_2$   
 $g_1$  feeds  $c_2$  to  $c_1$ .

This particular kind of asymmetrical *lujvo*, in which the *seltau* serves as the *selbri* of an abstraction which is a place of the *tertau*, is called an *implicit-abstraction lujvo*, because one deduces the presence of an abstraction which is unexpressed (implicit).

To give another example: the gismu “basti”, whose place structure is

**Example 12.13.5**

$b_1$  replaces  $b_2$  in circumstances  $b_3$

can form the lujvo “basygau”, with the place structure:

**Example 12.13.6**

$g_1$  (agent) replaces  $b_1$  with  $b_2$  in circumstances  $b_3$

where both “basti” and “basygau” are translated “replace” in English, but represent different relations: “basti” may be used with no mention of any agent doing the replacing.

In addition, “gasnu”-based lujvo can be built from what we would consider nouns or adjectives in English. In Lojban, everything is a predicate, so adjectives, nouns and verbs are all treated in the same way. This is consistent with the use of similar causative affixes in other languages. For example, the gismu “litki”, meaning “liquid”, with the place structure

**Example 12.13.7**

$l_1$  is a quantity of liquid of composition  $l_2$  under conditions  $l_3$

can give “likygau”, meaning “to liquefy”:

**Example 12.13.8**

$g_1$  (agent) causes  $l_1$  to be a quantity of liquid of composition  $l_2$  under conditions  $l_3$ .

While “likygau” correctly represents “causes to be a liquid”, a different lujvo based on “galfi” (meaning “modify”) may be more appropriate for “causes to become a liquid”. On the other hand, “fetsygau” is unsafe, because it could mean “agent in the event of something becoming female” (the implicit-abstraction interpretation) or simply “female agent” (the parallel interpretation), so using implicit-abstraction lujvo is always accompanied with some risk of being misunderstood.

Many other Lojban gismu have places for event abstractions, and therefore are good candidates for the tertau of an implicit-abstraction lujvo. For example, lujvo based on “rinka”, with its place structure

**Example 12.13.9**

event  $r_1$  causes event  $r_2$  to occur

are closely related to those based on “gasnu”. However, “rinka” is less generally useful than “gasnu”, because its  $r_1$  place is another event rather than a person: “lo rinka” is a cause, not a causer. Thus the place structure of “likyri’a”, a lujvo analogous to “likygau”, “is event  $r_1$  causes  $l_1$  to be a quantity of liquid of composition  $l_2$  under conditions  $l_3$ ” and would be useful in translating sentences like “The heat of the sun liquefied the block of ice.”

Implicit-abstraction lujvo are a powerful means in the language of rendering quite verbose bridi into succinct and manageable concepts, and increasing the expressive power of the language.

## 12.14 Anomalous *lujvo*

Some *lujvo* that have been coined and actually employed in Lojban writing do not follow the guidelines expressed above, either because the places that are equivalent in the *seltau* and the *tertau* are in an unusual position, or because the *seltau* and *tertau* are related in a complex way, or both. An example of the first kind is “*jdasesku*”, meaning “prayer”, which was mentioned in Section 12.7. The *gismu* places are:

### Definition 12.10

*lijda*       $l_1$  is a religion with believers  $l_2$  and beliefs  $l_3$   
*cusku*       $c_1$  expresses text  $c_2$  to audience  $c_3$  in medium  $c_4$

and “*selsku*”, the *tertau* of “*jdasesku*”, has the place structure:

### Example 12.14.1

$s_1$  is a text expressed by  $s_2$  to audience  $s_3$  in medium  $s_4$

Now it is easy to see that the  $l_2$  and  $s_2$  places are equivalent: the believer in the religion ( $l_2$ ) is the one who expresses the prayer ( $s_2$ ). This is not one of the cases for which a place ordering rule has been given in Section 7 or Section 13; therefore, for lack of a better rule, we put the *tertau* places first and the remaining *seltau* places after them, leading to the place structure:

### Example 12.14.2

$s_1$  is a prayer expressed by  $s_2 = l_2$  to audience  $s_3$  in medium  $s_4$  pertaining to religion  $l_1$

The  $l_3$  place (the beliefs of the religion) is dependent on the  $l_1$  place (the religion) and so is omitted.

We could make this *lujvo* less messy by replacing it with “*se seljdasku*”, where “*seljdasku*” is a normal symmetrical *lujvo* with place structure:

### Example 12.14.3

$c_1 = l_2$  religiously expresses prayer  $c_2$  to audience  $c_3$  in medium  $s_4$  pertaining to religion  $l_1$

which, according to the rule expressed in Section 12.9, can be further expressed as “*selseljdasku*”. However, there is no need for the ugly *selsel-* prefix just to get the rules right: “*jdasesku*” is a reasonable, if anomalous, *lujvo*.

However, there is a further problem with “*jdasesku*”, not resolvable by using “*seljdasku*”. No *veljvo* involving just the two *gismu* “*lijda*” and “*cusku*” can fully express the relationship implicit in prayer. A prayer is not just anything said by the adherents of a religion; nor is it even anything said by them acting as adherents of that religion. Rather, it is what they say under the authority of that religion, or using the religion as a medium, or following the rules associated with the religion, or something of the kind. So the *veljvo* is somewhat elliptical.

As a result, both “*seljdasku*” and “*jdasesku*” belong to the second class of anomalous *lujvo*: the *veljvo* doesn’t really supply all that the *lujvo* requires.

Another example of this kind of anomalous *lujvo*, drawn from the *tanru* lists in Chapter 5, is “*lange’u*”, meaning “sheepdog”. Clearly a sheepdog is not a dog which is a sheep (the symmetrical interpretation is wrong), nor a dog of the sheep breed (the asymmetrical interpretation is wrong). Indeed, there is simply no overlap in the places of “*lanme*” and “*gerku*” at all. Rather, the *lujvo* refers to a dog which controls sheep flocks, a “*terlanme jitro gerku*”, the *lujvo* from which is “*terlantroge’u*” with place structure:

**Example 12.14.4**

$g_1 = j_1$  is a dog that controls sheep flock  $l_3 = j_2$  made up of sheep  $l_1$  in activity  $j_3$  of dog breed  $g_2$

based on the gismu place structures

**Definition 12.11**

<i>lanme</i>	$l_1$ is a sheep of breed $l_2$ belonging to flock $l_3$
<i>gerku</i>	$g_1$ is a dog of breed $g_2$
<i>jitro</i>	$j_1$ controls $j_2$ in activity $j_3$

Note that this lujvo is symmetrical between “lantro” (sheep-controller) and “gerku”, but “lantro” is itself an asymmetrical lujvo. The  $l_2$  place, the breed of sheep, is removed as dependent on  $l_1$ . However, the lujvo “lange’u” is both shorter than “terlantroge’u” and sufficiently clear to warrant its use: its place structure, however, should be the same as that of the longer lujvo, for which “lange’u” can be understood as an abbreviation.

Another example is “xanmi’e”, “to command by hand, to beckon”. The component place structures are:

**Definition 12.12**

<i>xance</i>	$xa_1$ is the hand of $xa_2$
<i>minde</i>	$m_1$ gives commands to $m_2$ to cause $m_3$ to happen

The relation between the seltau and tertau is close enough for there to be an overlap:  $xa_2$  (the person with the hand) is the same as  $m_1$  (the one who commands). But interpreting “xanmi’e” as a symmetrical lujvo with an elided *sel-* in the seltau, as if from “se xance mindu”, misses the point: the real relation expressed by the lujvo is not just “one who commands and has a hand”, but “to command using the hand”. The concept of “using” suggests in the gismu “pilno”, with place structure

**Example 12.14.5**

$p_1$  uses tool  $p_2$  for purpose  $p_3$

Some possible three-part veljvo are (depending on how strictly you want to constrain the veljvo)

**Example 12.14.6**

⟨*ke*⟩ xance pilno ⟨*ke’e*⟩ minde  
(hand user) type-of commander

**Example 12.14.7**

⟨*ke*⟩ minde xance ⟨*ke’e*⟩ pilno  
(commander hand) type-of user

or even



**Example 12.14.8**

minde ke xance pilno  $\langle ke'e \rangle$   
 commander type-of (hand user)

which lead to the three different *lujvo* “*xanplimi'e*”, “*mi'erxanpli*”, and “*minkemxanpli*” respectively.

Does this make “*xanmi'e*” wrong? By no means. But it does mean that there is a latent component to the meaning of “*xanmi'e*”, the *gismu* “*pilno*”, which is not explicit in the *veljvo*. And it also means that, for a place structure derivation that actually makes sense, rather than being ad-hoc, the Lojbanist should probably go through a derivation for “*xancypliminde*” or one of the other possibilities that is analogous to the analysis of “*terlantroge'u*” above, even if he or she decides to stick with a shorter, more convenient form like “*xanmi'e*”. In addition, of course, the possibilities of elliptical *lujvo* increase their potential ambiguity enormously — an unavoidable fact which should be borne in mind.

## 12.15 Comparatives and superlatives

English has the concepts of “comparative adjectives” and “superlative adjectives” which can be formed from other adjectives, either by adding the suffixes “-er” and “-est” or by using the words “more” and “most”, respectively. The Lojbanic equivalents, which can be made from any *brivla*, are *lujvo* with the *tertau* “*zmadu*”, “*mleca*”, “*zenba*”, “*jdika*”, and “*traji*”. In order to make these *lujvo* regular and easy to make, certain special guidelines are imposed.

We will begin with *lujvo* based on “*zmadu*” and “*mleca*”, whose place structures are:

**Definition 12.13**

*zmadu*      $z_1$  is more than  $z_2$  in property  $z_3$  in quantity  $z_4$   
*mleca*      $m_1$  is less than  $m_2$  in property  $m_3$  in quantity  $m_4$

For example, the concept “young” is expressed by the *gismu* “*citno*”, with place structure:

**Definition 12.14**

*citno*      $c_1$  is young

The comparative concept “younger” can be expressed by the *lujvo* “*citmau*” (based on the *veljvo* “*citno zmadu*”, meaning “young more-than”).

**Example 12.15.1**

mi *citmau* do lo nanca be li xa  
 I am-younger-than you by-years the-number six.  
 I am six years younger than you.

The place structure for “*citmau*” is

**Example 12.15.2**

$z_1 = c_1$  is younger than  $z_2 = c_1$  by amount  $z_4$

Similarly, in Lojban you can say:

**Example 12.15.3**

do citme'a mi lo nanca be li xa  
 You are-less-young-than me by-years the-number six.  
 You are six years less young than me.

In English, “more” comparatives are easier to make and use than “less” comparatives, but in Lojban the two forms are equally easy.

Because of their much simpler place structure, *lujvo* ending in *-mau* and *-me'a* are in fact used much more frequently than “*zmadu*” and “*mleca*” themselves as *selbri*. It is highly unlikely for such *lujvo* to be construed as anything other than implicit-abstraction *lujvo*. But there is another type of ambiguity relevant to these *lujvo*, and which has to do with what is being compared.

For example, does “*nelcymau*” mean “*x* likes *y* more than *x* likes *z*”, or “*x* likes *y* more than *z* likes *y*”? Does “*klamau*” mean: “*x* goes to *y* more than to *z*”, “*x* goes to *y* more than *z* does”, “*x* goes to *y* from *z* more than from *w*”, or what?

We answer this concern by putting regularity above any considerations of concept usefulness: by convention, the two things being compared always fit into the first place of the *seltau*. In that way, each of the different possible interpretations can be expressed by SE-converting the *seltau*, and making the required place the new first place. As a result, we get the following comparative *lujvo* place structures:

**Definition 12.15**

<i>nelcymau</i>	$z_1$ , more than $z_2$ , likes $n_2$ by amount $z_4$
<i>selnelcymau</i>	more than $z_2$ , is liked by $n_1$ in amount $z_4$
<i>klamau</i>	more than $z_2$ , goes to $k_2$ from $k_3$ via $k_4$ by means of $k_5$
<i>selklamau</i>	$z_1$ , more than $z_2$ , is gone to by $k_1$ from $k_3$ via $k_4$ by means of $k_5$
<i>terklamau</i>	$z_1$ , more than $z_2$ , is an origin point from destination $k_2$ for $k_1$ 's going via $k_4$ by means of $k_5$

(See Chapter 11 for the way in which this problem is resolved when *lujvo* aren't used.)

The ordering rule places the things being compared first, and the other *seltau* places following. Unfortunately the  $z_4$  place, which expresses by how much one entity exceeds the other, is displaced into a *lujvo* place whose number is different for each *lujvo*. For example, while “*nelcymau*” has  $z_4$  as its fourth place, “*klamau*” has it as its sixth place. In any sentence where a difficulty arises, this amount-place can be redundantly tagged with “*vemau*” (for “*zmadu*”) or “*veme'a*” (for “*mleca*”) to help make the speaker's intention clear.

It is important to realize that such comparative *lujvo* do not presuppose their *seltau*. Just as in English, saying someone is younger than someone else doesn't imply that they're young in the first place: an octogenarian, after all, is still younger than a nonagenarian. Rather, the 80-year-old has a greater “*ni citno*” than the 90-year-old. Similarly, a 5-year-old is older than a 1-year-old, but is not considered “old” by most standards.

There are some comparative concepts which are in which the “*se zmadu*” is difficult to specify. Typically, these involve comparisons implicitly made with a former state of affairs, where stating a  $z_2$  place explicitly would be problematic.

In such cases, it is best not to use “*zmadu*” and leave the comparison hanging, but to use instead the *gismu* “*zenba*”, meaning “increase” (and “*jdika*”, meaning “decrease”, in place of “*mleca*”). The *gismu* “*zenba*” was included in the language precisely in order to capture those notions of increase which “*zmadu*” can't quite cope with; in addition, we don't have to waste

a place in *lujvo* or *tanru* on something that we'd never fill in with a value anyway. So we can translate "I'm stronger now" not as

**Example 12.15.4**  
 mi ca tsamau  
 I now am-stronger.

which implies that I'm stronger than somebody else (the elided occupant of the second or  $z_2$  place), but as

**Example 12.15.5**  
 mi ca tsaze'a  
 I increase in strength.

Finally, *lujvo* with a *tertau* of "traji" are used to build superlatives. The place structure of "traji" is

**Example 12.15.6**  
 $t_1$  is superlative in property  $t_2$ , being the  $t_3$  extremum (largest by default) of set  $t_4$

Consider the *gismu* "xamgu", whose place structure is:

**Example 12.15.7**  
 $xa_1$  is good for  $xa_2$  by standard  $xa_3$

The comparative form is "xagmau", corresponding to English "better", with a place structure (by the rules given above) of

**Example 12.15.8**  
 $z_1$  is better than  $z_2$  for  $xa_2$  by standard  $xa_3$  in amount  $z_4$

We would expect the place structure of "xagrai", the superlative form, to somehow mirror that, given that comparatives and superlatives are comparable concepts, resulting in:

**Example 12.15.9**  
 $xa_1 = t_1$  is the best of the set  $t_4$  for  $xa_2$  by standard  $xa_3$ .

The  $t_2$  place in "traji", normally filled by a property abstraction, is replaced by the *seltau* places, and the  $t_3$  place specifying the extremum of "traji" (whether the most or the least, that is) is presumed by default to be "the most".

But the set against which the  $t_1$  place of "traji" is compared is not the  $t_2$  place (which would make the place structure of "traji" fully parallel to that of "zmadu"), but rather the  $t_4$  place. Nevertheless, by a special exception to the rules of place ordering, the  $t_4$  place of "traji"-based *lujvo* becomes the second place of the *lujvo*. Some examples:

**Example 12.15.10**  
 la djudis. cu citrai lo'i lobypli  
 Judy is the youngest of all Lojbanists.

**Example 12.15.11**

la ajnctain. cu balrai lo'i skegunka  
Einstein was the greatest of all scientists.

**12.16 Notes on gismu place structures**

Unlike the place structures of *lujvo*, the place structures of *gismu* were assigned in a far less systematic way through a detailed case-by-case analysis and repeated reviews with associated changes. (The *gismu* list is now baselined, so no further changes are contemplated.) Nevertheless, certain regularities were imposed both in the choice of places and in the ordering of places which may be helpful to the learner and the *lujvo*-maker, and which are therefore discussed here.

The choice of *gismu* places results from the varying outcome of four different pressures: brevity, convenience, metaphysical necessity, and regularity. (These are also to some extent the underlying factors in the *lujvo* place structures generated by the methods of this chapter.) The implications of each are roughly as follows:

1. Brevity tends to remove places: the fewer places a *gismu* has, the easier it is to learn, and the less specific it is. As mentioned in Section 12.4, a *brivla* with fewer place structures is less specific, and generality is a virtue in *gismu*, because they must thoroughly blanket all of semantic space.
2. Convenience tends to increase the number of places: if a concept can be expressed as a place of some existing *gismu*, there is no need to make another *gismu*, a *lujvo* or a *fu'ivla* for it.
3. Metaphysical necessity can either increase or decrease places: it is a pressure tending to provide the “right number” of places. If something is part of the essential nature of a concept, then a place must be made for it; on the other hand, if instances of the concept need not have some property, then this pressure will tend to remove the place.
4. Regularity is a pressure which can also either increase or decrease places. If a *gismu* has a given place, then *gismu* which are semantically related to it are likely to have the place also.

Here are some examples of *gismu* place structures, with a discussion of the pressures operating on them:

**Definition 12.16**

*xekri*       $x_{e_1}$  is black

Brevity was the most important goal here, reinforced by one interpretation of metaphysical necessity. There is no mention of color standards here, as many people have pointed out; like all color *gismu*, “*xekri*” is explicitly subjective. Objective color standards can be brought in by an appropriate BAI tag such as “*ci'u*” (“in system”; see Chapter 9) or by making a *lujvo*.

**Definition 12.17**

*jbena*       $j_1$  is born to  $j_2$  at time  $j_3$  and location  $j_4$

The gismu “jbena” contains places for time and location, which few other gismu have: normally, the time and place at which something is done is supplied by a tense tag (see Chapter 10). However, providing these places makes “le te jbena” a simple term for “birthday” and “le ve jbena” for “birthplace”, so these places were provided despite their lack of metaphysical necessity.

**Definition 12.18**

*rinka*      event  $r_1$  is the cause of event  $r_2$

The place structure of “rinka” does not have a place for the agent, the one who causes, as a result of the pressure toward metaphysical necessity. A cause-effect relationship does not have to include an agent: an event (such as snow melting in the mountains) may cause another event (such as the flooding of the Nile) without any human intervention or even knowledge.

Indeed, there is a general tendency to omit agent places from most gismu except for a few such as “gasnu” and “zunkte” which are then used as tertau in order to restore the agent place when needed: see Section 12.13.

**Definition 12.19**

*cinfo*       $c_1$  is a lion of species/breed  $c_2$

The  $c_2$  place of “cinfo” is provided as a result of the pressure toward regularity. All animal and plant gismu have such an  $c_2$  place; although there is in fact only one species of lion, and breeds of lion, though they exist, aren’t all that important in talking about lions. The species/breed place must exist for such diversified species as dogs, and for general terms like “cinki” (insect), and are provided for all other animals and plants as a matter of regularity.

Less can be said about gismu place structure ordering, but some regularities are apparent. The places tend to appear in decreasing order of psychological saliency or importance. There is an implication within the place structure of “klama”, for example, that “lo klama” (the one going) will be talked about more often, and is thus more important, than “lo se klama” (the destination), which is in turn more important than “lo xe klama” (the means of transport).

Some specific tendencies (not really rules) can also be observed. For example, when there is an agent place, it tends to be the first place. Similarly, when a destination and an origin point are mentioned, the destination is always placed just before the origin point. Places such as “under conditions” and “by standard”, which often go unfilled, are moved to near the end of the place structure.