

## Semantics and the Lexicon in Modern Linguistics\*

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The article outlines the main features of the Meaning-Text linguistic theory and the corresponding linguistic model. The important role of the formalized lexicon of a particular type the *Explanatory Combinatorial Dictionary* is emphasized. Samples of level-specific representations of utterances within the Meaning-Text theory as well as of some rules are given with short explanations.

### 1 THEORETICAL FRAMEWORK

The presentation that follows is based on the Meaning-Text linguistic theory [= MTT]. Without entering into the details, I will simply indicate that this theory puts forward a formalized model of natural language a Meaning-Text Model [= MTM], which is a system of rules that simulates the linguistic behavior of humans. More specifically, an MTM is aimed at performing the transition from what is loosely called *meanings* (any information, or content, that a speaker may be willing to transmit by means of his language) and *texts* (physical manifestations of speech), and vice versa. A core component of an MTM, where the biggest part of data about specific language is stored, is a formalized semantically-oriented lexicon; in the MTT, such a lexicon is called an *Explanatory Combinatorial Dictionary* [= ECD].

An ECD-type lexicon must, and I think in the nearest future will, be one of the main components of any linguistic description. In conjunction with a formalized grammar of the language (syntax + morphology), it ensures meaning-to-text and text-to-meaning transitions. In other words, as the first step (if we consider the meaning-to-text transition), it allows the MTM to establish correspondences between a given Sem(antic) R(epresentation) and all D(eep-)Synt(actic)Rs that correspond to it. Then, the MTM goes from a given DSyntR to all (alternative) phonetic strings that, according to the

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speakers, may implement it as the signifiers of (more or less synonymous) real sentences. Thus, the vocation of an MTM and of an ECD is as follows:

From a **Sem-network**  
 to all corresponding Deep-Synt- and Surface-Synt-**trees**  
 to all corresponding Deep-Morph- and Surface-Morph-**strings**  
 to all corresponding Phonemic/Graphemic **strings**.

In more precise terms, in the MTT, a sentence *representation* at a particular level is a set of formal objects called *structures*, each of which is responsible for a particular aspect of sentence organization at this level. The set of sentence representations of all levels is as follows (starting from MEANING, i.e. Semantic Representation, and going to TEXTS, i.e. Surface-Phonological [=°phonetic] Representation):

Sem(antic) Representation	= <Sem-S(tructure); Sem-Comm(uni- cative) S; Sem-Rhetorical S; Referen- tial S>
D(eep)-Synt(actic) Representation	= <DSyntS; DSynt-CommS; DSynt- Anaph(orical) S; DSynt-Pros(odic) S>
S(urface)-Synt(actic) Representation	= <SSyntS; SSynt-CommS; SSynt- AnaphS; SSynt-ProsS>
DMorph(ological) Representation	= <DMorphS; DMorph-ProsS>
SMorph(ological) Representation	= <SMorphS; SMorph-ProsS>
DPhon(ological) Representation	= <DPhonS; DPhon-ProsS>
SPhon(ological) Representation	= <SPhonS; SPhon-ProsS>

The role of an ECD in transition  $\{\text{SemR}_i\} / \{\text{SPhonR}_j\}$  is crucial: it is in the ECD that the rules of the model find all the information which is associated with individual lexical units and which is necessary for the determination of well-formed configurations of linguistic signs that constitute actual sentences.

## 2 THE EXPLANATORY-COMBINATORIAL DICTIONARY

Given the central position of the ECD in an MTM, I will briefly characterize this dictionary. Its central feature is that it is PARAPHRASE-

BASED, that is, (quasi-synonymous) paraphrases constitute the main target and the main research tool for an ECD; cf. a sample set of such paraphrases in 5. This means that the ECD's foundations are semantic. I can state the following six major properties of an ECD that set it aside from other monolingual dictionaries:

- An ECD is elaborated within a coherent linguistic theory: the Meaning-Text theory, featuring well-developed semantic and syntactic modules, with a strong emphasis on the lexicon.
- An ECD is formally linked to a grammar; both are tuned to each other, so that the lexicon and the grammar are in complete logical agreement: all grammar rules are stated in terms of features and elements supplied in the lexical entries.
- An ECD is consistently geared to production: it is a synthesis (= active) dictionary.
- An ECD is centered around restricted cooccurrence, both syntactic and lexical, which is represented as exhaustively as possible.
- An ECD is an integral dictionary: it includes all of the information that is related to lexical units and could be needed for successful text synthesis.
- An ECD is a formalized dictionary (= a lexical database).

### 3 LEXICAL UNIT

A unit of description in an ECD is a *lexical unit* a word (= lexeme) or a set phrase (= full phraseme or quasi-phraseme, see Mel'čuk 1995, 1996) taken in one well-defined sense.

Extremely fine sense discrimination is one of the slogans of the ECD.

Each lexical unit has its lexical entry in the ECD, and each lexical entry of the ECD corresponds to one lexical unit.

Lexical units whose definitions share an important semantic component (known as *semantic bridge*) and whose radicals are identical are grouped under a *vocable* (= superentry). Within a vocable, the extraction of

common elements from different lexical units becomes possible: pieces of lexicographic information syntactic, lexical and/or morphological that are shared by several lexical units of a vocable are factored out and specified just once, at the beginning of the superentry.

#### 4 THE STRUCTURE OF AN ECD ENTRY

The ECD entry for a lexical unit L lexeme or phraseme has three main zones.

1) The SEMANTIC zone: the definition of L (= the SemR of L), which is based on a propositional form with variables for semantic actants of L and constitutes a strict decomposition of its meaning. For instance, consider the definitions for the verb [to] HELP (in one of its senses), the noun REVULSION and the noun CHALLENGE (the symbol || separates the presuppositional part of the definition to the left of it from the assertional part to the right of it):

*X helps Y to Z with W* : Y trying to do or doing Z, || X uses X's resources W, adding W to Y's resources with the goal that W facilitates for Y doing Z .

*X's revulsion for Y* : X perceiving Y, || X's (strong) negative emotion about Y which is similar to what people normally experience when they are in contact with something that makes them sick and such that it causes that X wants to avoid any contact with Y .

*X is a challenge for Y* : Y having to do X, || X is difficult and interesting for Y, which causes that Y wants to do X .

These definitions are written according to strict principles and rules of lexicographic description (Melčuk 1988b). They are in standardized English for the convenience of the reader and in order to facilitate the task of their authors and critics: the linguistic intuition of a speaker permits better judgments when applied to such linguistic expressions. For formal treatment, each definition has a corresponding representation in the form of a semantic network, see below.

2) The SYNTACTIC zone: the Government Pattern (= a subcategorization frame) of L, which specifies, for each Sem-actant of L, the corresponding DSynt-actant and lists all surface means of expressing it in the text as a function of L. Cf. the Government Pattern [= GP] for the verb (*to*) HELP:

X = I	Y =II	Z = III	W = IV
1. N	1. N	1. V <sub>inf</sub>	1. <i>with</i> N
		2. <i>to</i> V <sub>inf</sub>	2. <i>by</i> N
		3. <i>with</i> N	3. <i>by</i> V <sub>ger</sub>
		4. PREP <sub>dir</sub> N	

- 1) C<sub>III.1</sub> : X being directly involved in Z [= X does Z ]  
[C stands for *column*]
- 2) C<sub>III.2</sub> : X not being directly involved in Z [= X does not do Z  
himself, but provides some resources to Y ]  
**or** H. is in the passive
- 3) C<sub>III.4</sub> : Z = move PREP<sub>dir</sub> N

*Frederick helped the old gentleman finish his preparations <helped the boy to finish his studies with her generous financial assistance, helped Jack out of his coat, helped Jack up the stairs by a kick in the bottom /by pushing him hard>.*

Through Government Patterns,  
SemRs of lexical units link to their syntactic representations.

3) The LEXICAL zone: Lexical Functions [= LF] of L, which present, in a systematic and formal way, the whole of L s semantic derivation (paradigmatic lexical functions) and L s restricted lexical cooccurrence i.e., all of its collocations (syntagmatic lexical functions). Paradigmatic LFs correspond to derivational relations well known in linguistics: synonymy,

antonymy, conversion, nominalization, agent/patient noun, relative adjective, etc. A syntagmatic LF **f** is, roughly speaking, a very general and abstract meaning that can be expressed in a large variety of ways depending on L, which is the argument of **f**. For instance:

**Magn**(L): intensifier of L, i.e. a modifier that expresses a high degree of what is designated by L; ~ very, very much, completely

**Oper**<sub>1</sub>(L): support verb of L, i.e. a semantically empty verb that takes the first DSynt-actant of L as its subject and L itself as its main object; ~ do, make, have

**Real**<sub>1</sub>(L): verb of realization for L, i.e. a semantically full verb that means [the *i*-th DSynt-actant of L] does with L what this actant is supposed to do with L; ~ succeed, use, accomplish

### **English**

<b>Magn</b> ( <i>naked</i> )	= <i>stark</i>	<b>Oper</b> <sub>1</sub> ( <i>sovereignty</i> )	= <i>have</i> [~]
<b>Magn</b> ( <i>thin</i> )	= <i>as a rake</i>	<b>Oper</b> <sub>1</sub> ( <i>cry</i> )	= <i>let out</i> [ART ~]
<b>Magn</b> ( <i>patience</i> )	= <i>infinite</i>	<b>Oper</b> <sub>1</sub> ( <i>whack</i> )	= <i>fetch</i> [ <i>a</i> ~]
<b>Magn</b> ( <i>rely</i> )	= <i>heavily</i>	<b>Oper</b> <sub>1</sub> ( <i>support</i> )	= <i>lend</i> [~]
<b>Real</b> <sub>2</sub> ( <i>joke</i> )	= <i>get</i> [ART ~]		
<b>Real</b> <sub>2</sub> ( <i>demands</i> )	= <i>meet</i> [~]		
<b>Real</b> <sub>2</sub> ( <i>exam</i> )	= <i>pass</i> [ART ~]		
<b>Real</b> <sub>2</sub> ( <i>hint</i> )	= <i>take</i> [ART ~]		

### **Spanish**

<b>Magn</b> ( <i>loco</i> crazy)	= <i>como una cabra</i> as a she-goat
<b>Magn</b> ( <i>tráfico</i> traffic)	= <i>denso</i> dense
<b>Magn</b> ( <i>silencio</i> silence)	= <i>profundo</i> profound
<b>Magn</b> ( <i>comer</i> eat)	= <i>a dos carrillos</i> at two cheeks
<b>Oper</b> <sub>1</sub> ( <i>siesta</i> nap)	= <i> echar</i> throw [ART ~]
<b>Oper</b> <sub>1</sub> ( <i>cuesti n</i> question)	= <i>plantear</i> plant [ART ~]
<b>Oper</b> <sub>1</sub> ( <i>juramento</i> oath)	= <i>prestar</i> lend [~]
<b>Oper</b> <sub>1</sub> ( <i>resistencia</i> resistance)	= <i>poner</i> put [~]
<b>Real</b> <sub>1</sub> ( <i>tesis</i> thesis)	= <i>leer</i> read [ART ~]

<b>Real</b> <sub>1</sub> ( <i>bot n</i> button )	= <i>pulsar</i> push [ART ~]
<b>Real</b> <sub>1</sub> ( <i>condici n</i> condition )	= <i>cumplir</i> accomplish [ART ~]
<b>Real</b> <sub>3</sub> ( <i>orden</i> order )	= <i>ejecutar</i> execute [ART ~]

LFs of a lexical unit L consistently link with the definition of L, so that if, e.g., L has a **Real**<sub>i</sub>, it must have in its definition the corresponding semantic component: such that L is supposed to be used for ... , etc.

## 5 A SAMPLE SET OF APPROXIMATE PARAPHRASES

Consider the sentence (1):

- (1) *What has been discovered lends strong support to the view that the progress which lead to the most advanced Pre-Columbian society may have occurred much earlier than was previously hypothesized, in the words of Richard Hansen.*

The meaning expressed in (1) can be expressed as well by more than a million and a half other English sentences which can be constructed form the set of near-synonymous expressions given below:

This find What°has°been° The° {found discovered} {things } {objects } {found discovered}	clearly {shows } {indicates} {give_s_ } {suppli_es_ } {clear°indication convincing°argument convincingly demonstrate(s) lend(s) strong support to the view}	that {the°achievements the°progress the°developments the°advances}
$7^\circ \times 8^\circ \times 4^\circ = 224$		

{which } {that } {produced } {created } {lead°to }	the most sophisticated the most advanced the most developed	Pre-Columbian Society
$6^\circ \times 3^\circ \times 1^\circ = 18$		

{may°have } {have°probably }	occurred taken place happened	much earlier than much before what long time before the date that
$2^\circ \times 3^\circ \times 3^\circ = 18$		

was	before previously	assumed thought hypothesized believed	(as) said Richard Hansen according to R. Hansen in the words of R. Hansen
1°×°2°×°4°×°3°=°24			

### Error!

Such paraphrastic sets underlie SemRs used by the Meaning-Text theory and the Explanatory Combinatorial Dictionary: when discussing a specific SemR, in particular a lexicographic definition, the researcher uses paraphrases as his arguments and his source of linguistic insights. On the other hand, a SemR underlies such a paraphrastic set in a different sense: all the paraphrases in the set must be obtainable from this SemR and/or from the SemRs (quasi-)equivalent to it by the rules of the corresponding Meaning-Text Model.

## 6 A SAMPLE SEMANTIC REPRESENTATION

See Figure 1.

### Explanations

∇ Semantic Structure

Some of the semantemes used:

time.of→X : moment in which X takes place ( the time of saying is  
before now ⇔ SAY<sub>act, ind, past</sub> ⇔ *said*)

X←is.challenge.for→Y ( something that is part of excavating the  
site by persons<sub>i</sub> is a challenge for persons<sub>i</sub> )

X←is.certain.of→Y ( X is certain that Y has taken place )

X←is.of.ethnicity→Y ( people of ethnicity Maya = Mayans )

X who says something belongs to the group α : speaking of α, X can  
say *we*



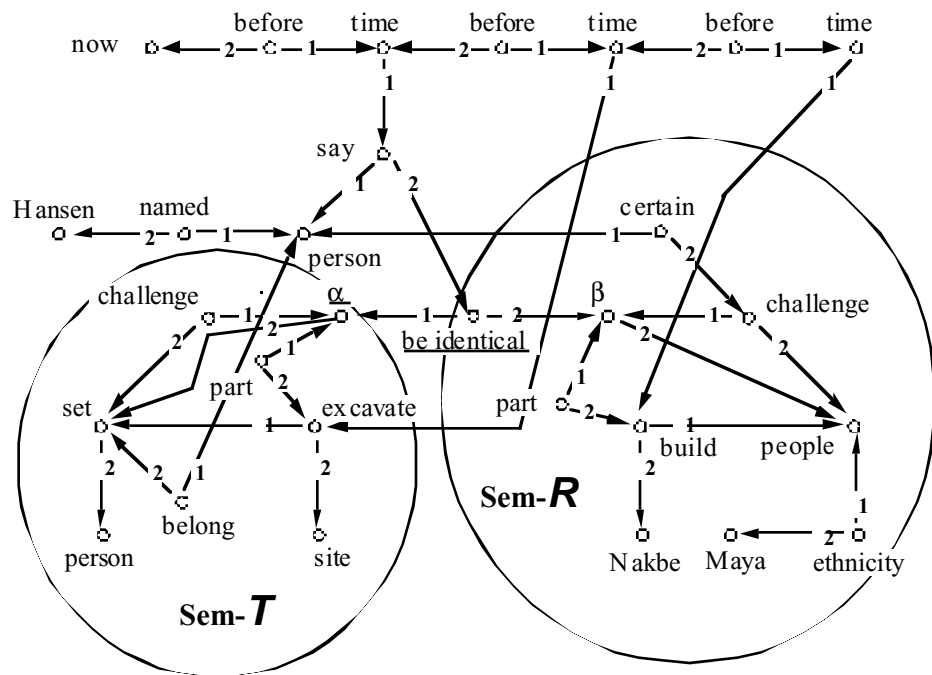


Figure 1  
Semantic Representation of Sentences (2)-(4)

$\alpha$  and  $\beta$  are abbreviations for particular actions and states of persons; the actants of  $\alpha$  and  $\beta$  are not shown in order to avoid cluttering the diagram with too many details

### ∩ Sem-Communicative Structure

The Semantic Theme [= Sem-**T**] of the starting meaning is SOMETHING [=  $\alpha$ ] faced by the persons; excavating the site and being a challenge for them;  $\alpha$  is the Comm-dominant node of the Sem-**T** (underscored).

About this Sem-**T** it is asserted that this  $\alpha$  IS IDENTICAL to ...; be.identical is the Comm-dominant node of the Sem-**R** (also underscored).

Semantemes that remain outside of the Sem-**T** and the Sem-**R** are Sem-Comm-Specifiers. (A Sem-Comm-Specifier is a semanteme configuration that, so to speak, sets the scene for the main statement and characterizes this scene from the viewpoint of when, where, in what way, with what purpose, etc. or according to whom, as in this case the situation in question has taken or is taking place.)

Here are three English sentences that express the above SemR:

- (2) *We experienced the same challenges in excavating the site that the Mayans must have encountered when they built Nakbe, Hansen said.*
- (3) *Hansen said that difficulties that had to be faced by him and by other archeologists excavating this site were similar to those which Mayans probably had met with when erecting Nakbe.*
- (4) *The problems into which had run the archeologists during the excavation of the site were, according to Hansen, very much like those which Mayans could have had experienced while building Nakbe.*

Note that the starting SemR is, so to speak, underspecified: it does not necessarily contain all the semantic details that are expressed in the sentences synthesized from it. In the transition SemR / DSyntR particular lexical units are brought in that can make the initial meaning more (or less) precise and elaborate. Therefore, the paraphrases obtained from a SemR are not 100% synonymous: they can differ semantically, but in such a way that this is considered irrelevant in the given act of linguistic communication.

## **7 A SAMPLE DEEP-SYNTACTIC REPRESENTATION**

I show here see Figure 2 the (partial) DSyntR of sentence (2), namely its DSyntS and its DSynt-AnaphS (dashed-line arrows show the coreference of some lexical nodes) plus a partial specification of its DSynt-CommS; the DSynt-ProsS is not presented at all.

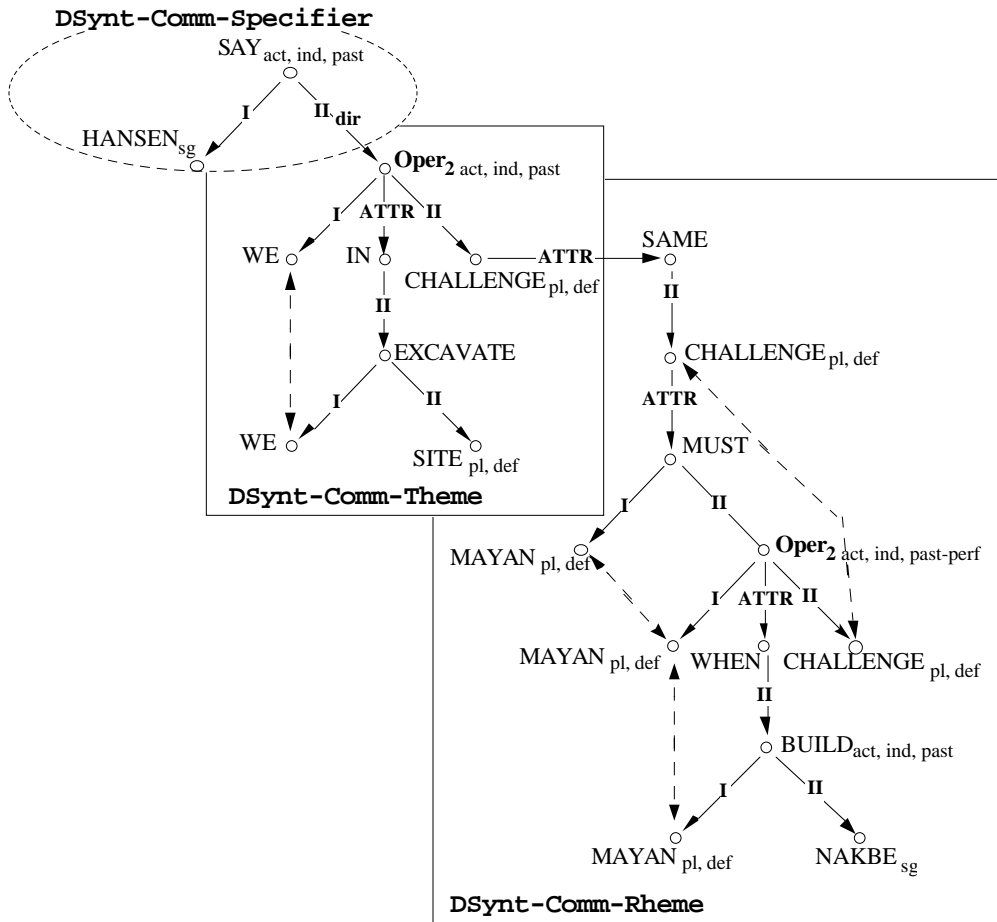


Figure 2  
Deep-Syntactic Representation of Sentence (2)

### Explanations

Possible values of the Lexical Function **Oper<sub>2</sub>**(challenge) are *experience* [ART°~] and *encounter* [ART ~]. (**Oper<sub>2</sub>** is similar to **Oper<sub>1</sub>**: it is also a support verb of a lexical unit L, i.e. a semantically empty verb that takes the DSynt-actant **II** of L as its subject and L itself as its main object; ≈° undergoo , be implicated , receive .)

The DSyntS is supplied with its DSynt-Communicative Structure: *We experienced the challenges in excavating the site* constitutes the DSynt-**T** and *the same that Mayans must have encountered...*, the DSynt-**R**; the

phrase *Hansen said* is communicatively a DSynt-Comm-Specifier, which is outside of the main DSynt-Communicative division of the sentence and can be linearly placed in any position with respect to the DSynt-**T** and DSynt-**R** (before, after, or between them or even inside the DSynt-**T**). Syntactically, the verb SAY governs a Direct Speech utterance, which is shown by a special DSynt-Relation **II<sub>dir</sub>**.

## 8 A SAMPLE LEXICAL ENTRY OF AN EXPLANATORY COMBINATORIAL DICTIONARY

### REVULSION

*X's revulsion for Y*  $\equiv$  X perceiving Y, || X's (strong) negative emotion about Y which is similar to what people normally experience when they are in contact with something that makes them sick and such that it causes that X wants to avoid any contact with Y.

#### Government Pattern

X = I	Y = II
1. N s	1. <i>against</i> N 2. <i>at</i> N 3. <i>for</i> N 4. <i>toward</i> N

1) C<sub>II.2</sub> : N is something that can be seen or felt [but not heard!]

*John's revulsion \*at [correct: for] these shouts*

2) C<sub>II.4</sub> : N denotes people

*John's <his> revulsion against racism <against Mary's greed>; John's <his> revulsion at such behavior <at the sight of seafood>;*

*John's <his> revulsion for work <for all those killings; for this melody, for/toward all those scoundrels>;*

*John's <his> revulsion toward the government*

### Lexical Functions

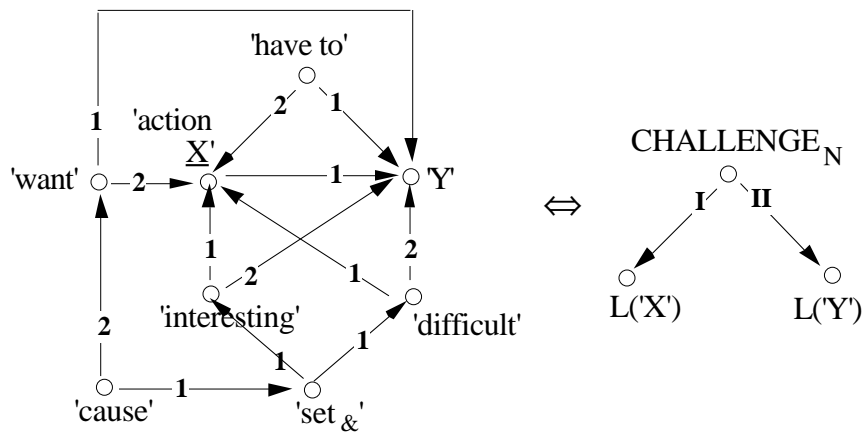
Syn <sub>i</sub>	: distaste
Syn <sub>i</sub>	: repugnance; repulsion; disgust; loathing
Anti <sub>i</sub>	: attraction
Conv <sub>21</sub> Anti <sub>i</sub>	: appeal <sub>N</sub>
A <sub>1</sub>	: revulsed
Magn + A <sub>1</sub>	: be filled [with ~ (about N=Y)]
Adv <sub>1</sub>	: in [~]
Magn + Adv <sub>1</sub>	: well up in [~]
Propt	: from [~]
Able <sub>2</sub>	: revulsive
Magn + Able <sub>2</sub>	: of utmost [~]   G = SCENE, SIGHT [G stands for the Syntactic Governor of the value of the LF in question]
Qual <sub>1</sub>	: squeamish; overly sensitive
Magn	: violent < extreme < utmost
AntiMagn	: slight
Oper <sub>1</sub>	: experience, feel [ ~ for/toward N=Y]
Conv <sub>21</sub> Caus <sub>2</sub> Oper <sub>1</sub>	: be driven [to ~]   passive only
Magn + Labor <sub>21</sub>	: fill [N=X with ~]
Caus <sub>2</sub>	: revolt [N=X]
Adv <sub>1</sub> Manif	: with [~]

### Examples

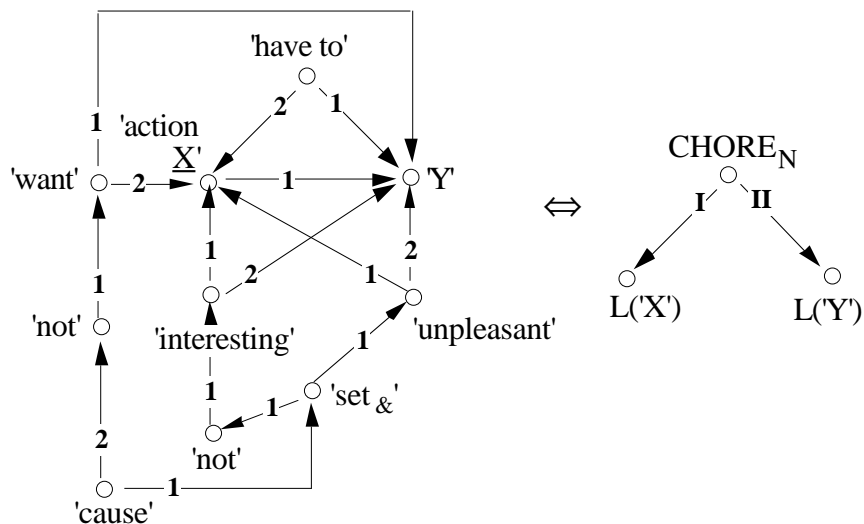
Any revulsion they might feel from fat-ass bastards they ran up against professionally was *ad hominem* and not *ad genus* [A. Lurie]. I felt no revulsion for her maternal fantasies, only a practical concern. She met his advances with revulsion. ≈ She turned away in revulsion. It was a scene of utmost revulsion. Pam was driven to revulsion (by the sight of the dead animal). <\*The sight of the dead animal drove Pam to revulsion>. Revulsion at slaughter cut war short [newspaper heading].

## 9 SAMPLE SEMANTIC TRANSITION RULES

Semantic transition rules are formal equivalents of lexicographic definitions, ECD-style. They constitute the (core of the) Semantic Module of an MTM, that is, the module responsible for the correspondence  $\{\text{SemR}_1\} \Leftrightarrow \{\text{DSyntR}_j\}$ . Here are the Sem-Rules for the nouns CHALLENGE and CHORE:



*This is a challenge for Alain; They meet <encounter, face> a challenge.*



*This is a chore for Alain.*

In both cases, the rules describe the predicative expressions [= propositional forms] *X is a challenge/a chore for Y*, rather than the simple nouns CHALLENGE and CHORE.

One clearly sees the semantic differences between the two lexemes: *challenge X* is something interesting for Y, which makes Y want to do X; while *chore X* is something **not** interesting for Y, which makes Y **not** want to do X. CHALLENGE and CHORE are thus antonyms. (More precisely, they are non-exact antonyms: a CHALLENGE is something that is hard to accomplish, while a CHORE can be simply unpleasant.)

## 10 SEMANTIC DECOMPOSITIONS

Semantic decompositions are controlled by paraphrastic equivalences (=°synonymy). Cf.:

*X is sure that P* : Having the belief "P has taken/is taking/will be taking place," X is unwilling to admit that P has not taken/is not taking/will not be taking place

*X doubts that P* : Not having the belief "P has taken/is taking/ will be taking place," X is not unwilling to admit that P has not taken/is not taking/will not be taking place

Sentences in (5)-(9) demonstrate the appropriateness of the semantic components in our definitions of *be sure* and *doubt*. Thus, sentence (5) is OK, because *I am not sure that Arthur is in Montreal* means Having the belief "Arthur is in Montreal" I am not unwilling to admit that Arthur is not in Montreal, and this is perfectly compatible with the first part of the sentence. However, in (6) the second part of the sentence contradicts the presupposition of the first part, and as a result the sentence is contradictory.

(5) *I believe that Arthur is in Montreal, but I am not sure.*

(6) *I am sure that Arthur is in Montreal, #but I don't believe that.*

[The symbol "#" indicates pragmatic or logical incorrectness.]

(7) *I believe that Arthur is in Montreal, #but I doubt it.*

(8) *I am sure that Arthur is in Montreal.* =  
*I don't doubt that Arthur is in Montreal.*

(9) *I am not sure that Arthur is in Montreal.* =  
*I doubt that Arthur is in Montreal.*

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(An attempt at self-promotion)

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