

Thematic Roles in Linguistics

Martha Palmer
University of Colorado

LING 7800/CSCI 7000-017
January 17, 2013

1



Outline

- Fillmore – Cases
 - useful generalizations, fewer sense distinctions,
- Jackendoff – Lexical Conceptual Structure
 - Thematic roles are defined by the predicates they are arguments to
- Dowty – Proto-typical Agents and Patients
 - A bag of “agentive” entailments
- Levin – Verb classes based on syntax
 - syntactic behavior is a reflection of the underlying semantics

2



The Case for Case, *Charles J. Fillmore*

- Problems with Previous Work
- Case Theory

Thanks to Steve Bethard for the slides



Problems with previous work

- Focus on morphology, ignoring syntax
- The nominative (subject) was largely ignored
 - 'dative of separation', 'dative of possession', etc.,
- Assumption of Subject/Predicate division
- The classification criteria were not rigorous
 - Mix of syntactic, historical, and semantic
 - Use of a 'leftover' or 'residue' case



Case Theory

- Case relations occur in deep-structure
 - Surface-structure cases are derived
- A sentence is a verb + one or more NPs
 - Each NP has a deep-structure case
 - *A*(gentive)
 - *I*(nstrumental)
 - *D*(ative) - recipient
 - *F*(active) – result, effected object
 - *L*(ocative)
 - *O*(bjective) – affected object, theme
 - Subject is no more important than Object
 - Subject/Object are surface structure



Case Selection

- Noun types
 - Different cases require different types of nouns
 - E.g. $N \rightarrow [+animate]^{A,D}[X_Y]$
- Verbs frames
 - Verbs require arguments of particular cases
 - E.g.
 - *sad* [__D]
 - *give* [__O+D+A]
 - *open* [__O(I)(A)]



Case Theory Benefits

- Fewer tokens
 - Fewer verb senses
 - E.g. *cook* [__O(A)] covers
 - Mother is cooking the potatoes
 - The potatoes are cooking
 - Mother is cooking
- Fewer types
 - “Different” verbs may be the same semantically, but with different subject selection preferences
 - E.g. *like* and *please* are both [__O+D]



Summary

- Each verb is associated with a frame
 - Frames indicate the cases of each argument
- Language dependent surface phenomena
 - Subject/Object
 - Case markings
- From syntax to surface structure
 - Verb argument movement
 - Verb argument copying



Issues

- Patient vs. Theme?
 - *The kitten licked my fingers.*
 - *The ascetic Shiva is smeared with ashes.*
 - *The rascal was tarred and feathered and ridden out of town on a rail.*
- Agents?
 - *The sun melted the ice.*
 - *The clothes dryer doesn't dry clothes well.*

9



Issues, Multiple roles?

- Θ -Criterion (GB Theory): each NP of predicate in lexicon assigned unique θ -role (Chomsky 1981).

[_{Agent (or Source)} *Esau*] sold [_{Theme} *his birthright*]
[_{Goal} *to Jacob*] for a *bowl of porridge*.

[_{Goal} *Esau*] sold *his birthright*
[_{Source} *to Jacob*] for a [_{Theme} *bowl of porridge*].

Jackendoff

10



Lexical Conceptual Structures, *Ray Jackendoff*

- Decomposition into primitive semantic predicates – Thematic Relations
- Thematic roles inherit their meaning from the relations they are in

11



Semantic Decomposition

- Markers
 $\left[\begin{array}{l} \text{HORSE} \\ \text{RED} \end{array} \right]$ *the red horse*
- Functions
SEE(x,y) *the man saw the (red) horse*
SEE(x,HORSE)
SEE(THE MAN,THE HORSE)
SEE(X1, Y1)



Five Semantic Functions

- GO
- BE
- STAY
- LET
- CAUSE



GO – Change of location

The train traveled from Detroit to Cincinnati.

The hawk flew from its nest to the ground.

An apple fell from the tree to the ground.

The coffee filtered from the funnel into the cup.

[GO (x,y,z)
THROUGH THE AIR/DOWNWARD]

THEME GOES FROM SOURCE, TO GOAL



Full representation

[event GOPOSIT

([_{thing} John],

[_{path} FROM ([place AT (Denver)])],

[_{path} TO ([place AT (San Francisco)])]

[MANNER: Drivingly]]

15



Satellite framed vs. Verb framed motion verbs – *basis of Interlingua*

Verb-framed: French, Spanish

GO (Theme, Source, Goal)

Manner

Traverse the lake by swimming

■ Satellite-framed: English

GO (Theme, Source, Goal)

Manner

Swim across the lake.

16



Mapping from Syntax to Semantics

$\left. \begin{array}{l} /flaj/ \\ + V \\ + [NP^1 \text{ ____ } (from NP^2) (to NP^3)] \\ \left[\begin{array}{l} GO (NP^1, NP^2, NP^3) \\ THROUGH THE AIR \end{array} \right] \end{array} \right\}$



BE – Stationary location

Max is in Africa.

The vine clung to the wall.

The dog is on the left of the cat.

The circle contains/surrounds the dot?

BE(x,y)

THEME IS AT LOCATION

BE (THE DOG, LEFT OF (THE CAT))



STAY – Durational stationary location

The bacteria stayed in his body.

Stanley remained in Africa.

Bill kept the book on the shelf.

STAY(x,y)

THEME IS AT LOCATION for a duration

STAY (STANLEY, AFRICA) (for two years)



Locational modes: POSIT, POSS, ID

The train traveled from Detroit to Cincinnati.

$\left[\begin{array}{l} GO (x,y,z) \\ POSIT \end{array} \right]$

Harry gave the book to the library.

$\left[\begin{array}{l} GO (x,y,z) \\ POSS \end{array} \right]$

The book belonged to the library..

$\left[\begin{array}{l} BE (x,z) \\ POSS \end{array} \right]$



Locational modes: POSIT, POSS, ID

The *bacteria* stayed in his *body*.

[STAY (x,z)
POSIT]

The *library* kept the *book*.

[STAY (x,z)
POSS]



Locational modes: POSIT, POSS, ID

*The *coach* changed from a *handsome young man* to a *pumpkin*.

[GO_{IDENT} (x,y,z)]

Princess Mia changed from an *ugly duckling* into a *swan*.

[GO_{IDENT} (x,y,z)]

Universal grammar?



Causation and Permission

CAUSE and LET

The *rock* fell from the *roof* to the *ground*.

[GO_{POSIT} (x,y,z)]

Linda lowered the *rock* from the *roof* to the *ground*.

[CAUSE (a, GO_{POSIT} (x,y,z))]

Linda dropped the *rock* from the *roof* to the *ground*.

[LET (a, GO_{POSIT} (x,y,z))]



INSTRUMENTS

Linda lowered the *rock* from the *roof* to the *ground* with a *cable*.

[CAUSE (a, GO_{POSIT} (x,y,z))
Inst: i]

Instruments only occur with causation.

CAUSE always has an *event* second argument.

Dollie caused *Martin* to be happy.



Lexical Conceptual Structure

concept	POSIT	POSS	IDENT
GO	go	receive	become
motional	fall	inherit	change
BE	be	have	be
punctual	contain	own	seem
STAY	stay	keep	stay
durational	remain		remain
CAUSE(a,GO)	bring, take	obtain, give	make,elect
CAUSE(a,STAY)	keep, hold	keep, retain	keep
LET(a,GO)	drop,release	accept, fritter	
LET(a,BE)	leave, allow	permit	leave

Rules of inference

CAUSE(a, event) -> event.

Issues

- Ducks vs. Geese?
- Abstract concepts?

Thematic Proto-Roles and Argument Selection, *David Dowty*

- Role definitions have to be determined verb by verb, and with respect to the other roles

- Thanks to Michael Mulyar for slides

Context of Dowty's work

- Thematic relations
 - (Gruber 1965, Jackendoff 1972)
- Traditional thematic roles types include:
 - Agent, Patient, Goal, Source, Theme, Experiencer, Instrument
- "Argument-Indexing View": thematic roles objects at syntax-semantics interface, determining a syntactic derivation or the linking relations.

29



Problems with Thematic Role Types

- Fragmentation: Cruse (1973) subdivides Agent into four types.
- Ambiguity: Andrews (1985) is Extent, an adjunct or a core argument?
- Symmetric stative predicates: e.g. "This is similar to that" Distinct roles or not?
- Searching for a Generalization: What is a Thematic Role?



Proto-Roles

- Event-dependent Proto-roles introduced
- Prototypes based on shared entailments
- Grammatical relations such as subject related to observed (empirical) classification of participants
- Typology of grammatical relations
- Proto-Agent
- Proto-Patient



Proto-Agent

- Properties
 - Volitional involvement in event or state
 - Sentience (and/or perception)
 - Causing an event or change of state in another participant
 - Movement (relative to position of another participant)
 - (exists independently of event named)
 - *may be discourse pragmatic



Proto-Patient

- Properties:
 - Undergoes change of state
 - Incremental theme
 - Causally affected by another participant
 - Stationary relative to movement of another participant
 - (does not exist independently of the event, or at all) *may be discourse pragmatic



Argument Selection Principle

- For 2 or 3 place predicates
- Based on empirical count (total of entailments for each role).
 - Greatest number of Proto-Agent entailments → Subject;
 - greatest number of Proto-Patient entailments → Direct Object.
- Alternation predicted if number of entailments for each role similar (non-discreteness).



Worked Example: Psychological Predicates

Examples:

Experiencer Subject	Stimulus Subject
<i>x likes y</i>	<i>y pleases x</i>
<i>x fears y</i>	<i>y frightens x</i>

Describes “almost the same” relation

Experiencer: sentient (P-Agent)

Stimulus: causes emotional reaction (P-Agent)

Number of proto-entailments same; but for stimulus subject verbs, experiencer also undergoes change of state (P-Patient) and is therefore lexicalized as the patient.



Diathesis Alternations

Alternations:

- Spray / Load
- Hit / Break

Non-alternating:

- Swat / Dash
- Fill / Cover



Spray / Load Alternation

Example:

Mary loaded the hay onto the truck.

Mary loaded the truck with hay.

Mary sprayed the paint onto the wall.

Mary sprayed the wall with paint.

- Analyzed via proto-roles, not e.g. as a theme / location alternation.
- Direct object analyzed as an Incremental Theme, i.e. either of two non-subject arguments qualifies as incremental theme. This accounts for alternating behavior.



Hit / Break Alternation

John hit the fence with a stick.

John hit the stick against a fence.

John broke the fence with a stick.

John broke the stick against the fence.

- Radical change in meaning associated with *break* but not *hit*.
- Explained via proto-roles (change of state for direct object with break class).



Swat doesn't alternate...

swat the boy with a stick

**swat the stick at / against the boy*

- Dowty suggests subtle semantic reasons for why these verbs do not alternate in terms of type of effect on patient.
- Hit alternation explained via relative significance of movement to participants.
- Are there semantic differences between types of direct objects, e.g. between effector and affected type arguments in diathesis alternations, necessitating a different syntactic analysis?



Fill / Cover

Fill / Cover are non-alternating:

Bill filled the tank (with water).

**Bill filled water (into the tank).*

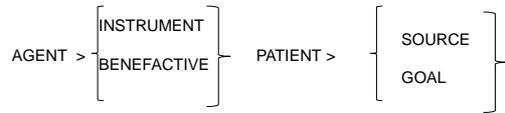
Bill covered the ground (with a tarpaulin).

**Bill covered a tarpaulin (over the ground).*

- Only goal lexicalizes as incremental theme (direct object).



Dowty's Hierarchy (English)



Conclusion

- Dowty argues for Proto-Roles based on linguistic and cognitive observations.
- Three main areas of analysis: symmetric predicates, diathesis alternations, unaccusativity
- Objections: Are P-roles empirical (*hit* class)?
Are P-roles event dependent (possibly in need of revision, e.g. something like p-patients named by event vs. p-patients defined by event)?

