Lexicon in Linguistic Theory

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Lecture 4: Structure of a Lexical Entry 1: Argument Structure and Event Structure
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Structure of a Lexical Entry 1: Argument Structure and Event Structure

- Notion of *event* and aspectual features
- Lexical and grammatical aspect
- Event types and their diagnostics
- Event type as a property of phrases and sentences
- Perspectives on event decomposition and Event Structure
- Eventive reading of nouns and adjectives

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Event as a part of natural language predicate

- **Event**: any kind of situation or happening denoted by a predicate.
- Reichenbach (1947) and Davidson (1967): events should be included into the ontology of semantic entities of natural language predicates.
  
  a. **Brutus stabbed Caesar** in the back, in the Forum, with a knife.
  b. Brutus did it and everyone witnessed it.
  c. $\exists e \exists x [\text{stab}(Brutus, Caesar, e)] \rightarrow$ event as part of AS
     ‘There was a stabbing event between Brutus and Caesar.’
  d. $\exists e \exists x [\text{stab}(e) \land \text{AG}(e, Brutus) \land \text{PAT}(e, Caesar)] \rightarrow$ event as the only V argument
Temporal information associated to events

■ **Tense**: linguistic category that locates events in time and relative to other events and time points.

a. Kim sang.  
\[ \text{E} < \text{S 'now'} \]

b. Kim will sing.  
\[ \text{S 'now'} < \text{E} \]

c. Kim is singing.  
\[ \text{S = E} \]

■ Different interpretations of the same tense:
  - *He is smoking* - ongoing event in the present
  - *He smokes* - habit that presently holds

■ **Aspect**: linguistic category that encodes the internal temporal structure and distribution of events
- **Durativity**: Does the event last for some time or is it instantaneous?
  - *Mike built the house*/ *Mike exploded the balloon*

- **Boundedness**: Does the event come to an end or not?
  - *Mike built the house for two years*
  - *Mike was building the house*/ *Mike is in Boston*

- **Dynamicy**: Does the event involve some kind of change or not?
  - Stative events: *know, love, be tall, be sick*
  - Dynamic events: *John {ran/was running}, John is working*

- **Telicity**: Does the event reach a natural culmination?
  - Telic events: *John read the book*
  - Atelic events: *John read*

- **Iteration**: Is the event composed of several distinct events or just one single event?
  - *The ball bounced along the road*/ *Li visited his parents every day*
  - *The baby sneezed once*

- **Intensity**: What degree of force does the event have?
  - *He burned himself* - regular intensity
  - *The building burned down* - high intensity

References:

- Pustejovsky and Batiukova

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Grammatical aspect

- Aspectual meanings can be encoded lexically (by the verbal root) or morphosyntactically (through explicit grammatical markers).

- **Grammatical aspect**: usually expresses a particular perspective on the event (Smith 1991)
  - *Perfective aspect*: we ‘zoom out’ on the event and get a full view, including the initial and final endpoints.
  - *Imperfective aspect*: we ‘zoom in’ on the event and can observe its intermediate stages (but lose sight of the beginning and the end).

- Russian: all V forms have a perfective and an imperfective form.
  a. **PERFECTIVE**: vybrosit’\(^P\) ‘throw away’
  b. **IMPERFECTIVE**: vybras-yva-t’\(^I\) ‘be in the process of throwing away repeatedly or habitually’

- Spanish: the same morphemes encode tense and aspect
  a. Juan trabaj-a-ba en el campo.
     ‘Juan was working the land.’
  b. Juan trabaj-ó en el campo.
     ‘Juan worked the land.’

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Lexical aspect: event types

Certain combinations of aspectual features are lexicalized as event types (Vendler 1967):

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Durativity</th>
<th>Dynamicity</th>
<th>Telicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Activity</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Accomplishment</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Achievement</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Semelfactive</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>
Event type diagnostics

- The presence of certain sentential components is often indicative of the overall event type of the predicate and the aspectual class of its head (V or other event-denoting word).

- **BUT:** these diagnostics should be used with caution: certain predicate components (e.g., time adverbials) function as event predicates taking the V and its arguments as their argument. They can *impose* their aspectual requirements on the V leading sometimes to *event-type shifts*.

- Groups of aspectual diagnostics in English: → sec. 9.3.3.
  1. **TEMPORAL MODIFIERS:** time adverbials and the adverbial *almost*;
  2. **ASPECTUAL VERBS:** *begin*, *finish*, *stop*, and others;
  3. **TENSE INTERPRETATION:** present and progressive forms;
  4. **IMPERFECTIVE PARADOX:** interpreting predicates in the imperfect form.
Factors affecting the ET of complex expressions

- The ET is *compositional*.
- Lexical aspect of the V
  - a. John rolled the dough \{for an hour/ *in an hour\}.
    Activity V → atelic predicate
  - b. John made the dough \{*for an hour/ in an hour\}.
    Accomplishment V → telic predicate
- Grammatical aspect of the V:
  simple past → PERF aspect; progressive → IMPERF
  - a. John made the dough \{*for an hour/ in an hour\}.
  - b. John was making the dough \{*for an hour/ *in an hour\}.
- Number of the subject and the V complements:
  PL → [+durantive] ( [+unbounded])
  - a. John arrived at the refugee camp \{*for two weeks/ in two weeks\}.
    PREP.PHASE
  - b. The evacuees arrived at the refugee camp \{for two weeks/ in two weeks\}. ACC/ PREP.PHASE
Factors affecting the ET of complex expressions

- Determiners with the subject and the verbal complements:
  Bare NPs $\rightarrow [-\text{bounded}]$; DPs $\rightarrow [+\text{bounded}]$
  
  a. Some evacuees arrived at the refugee camp $\{?\text{for two weeks/ in two weeks}\}$.
  b. Evacuees arrived at the refugee camp $\{\text{for two weeks/ *in two weeks}\}$.
  c. John ate two apples $\{?\text{for ten minutes/ in ten minutes}\}$.
  d. John ate apples $\{\text{for ten minutes/ *in ten minutes}\}$.

- Choice of preposition introducing the V arguments:
  a. John walked into the train station $\{*\text{for ten minutes/ in ten minutes}\}$.
  b. John walked $\{\text{toward/ from}\}$ the train station $\{\text{for ten minutes/ *in ten minutes}\}$.
Notion of Event Structure

- One limitation of feature-based approaches to aspect: they are not related to the AS of the predicates.
- **Event Structure**: definition of the event type of lexical items and predicates in terms or ordered subevents or phases.
- Evidence that events have identifiable parts:
  - a. John almost ran. =‘almost started running’ → one subevent
  - b. John almost quit his singing career.
    =‘almost started being a non-singer’ → one subevent
  - c. John almost recorded an album.
    =‘almost started recording an album’/‘did some recording but didn’t finish it’ → two subevents

- Three main approaches to event decomposition
  1. Events as part of lexical-conceptual structure.
  2. An independent level of Event Structure with subevents associated with predicate decomposition of the V.
  3. Integration of strategy (2) with a dimension of scalar change.
Events as part of general lexical-conceptual structure


- Based on a limited set of primitive predicates, which refer to the meaning components shared by predicates with the same syntactic and aspectual behavior.
  - **BE**: stative predicates, with Agent (\(AG\)) or Theme (\(TH\)) as arguments.
  - **ACT/DO**: activity/agentive predicates, with Agent argument (+Theme argument).
  - **CAUSE**: causative predicates (ACCs and ACHs), with two event arguments, or an Agent argument and an event argument.
  - **BECOME**: change-of-state predicates (ACHs and ACCs).
Events as part of general lexical-conceptual structure

- **STATES**
  a. John is tall.  
    \[
    [\text{Ev BE} ([\text{Th John}],[\text{Prop tall}])]
    \]
  b. The glass is broken.  
    \[
    [\text{Ev BE} ([\text{Th the glass}],[\text{Prop broken}])]
    \]

- **ACTIVITIES**
  a. John is walking.  
    \[
    [\text{Ev ACT} ([\text{Ag John}],[\text{Ev walk}])]
    \]
  b. John is walking his dog.  
    \[
    [\text{Ev CAUSE}([\text{Ag John}],[\text{ACT}([\text{Ag his dog}],[\text{Ev walk}])])]
    \]
  c. John is pushing the cart.  
    \[
    [\text{Ev ACT} ([\text{Ag John}],[\text{Ev push [Th the cart]}])]
    \]
Events as part of general lexical-conceptual structure

- **ACCOMPLISHMENTS**
  
a. The ice melted.
  \[ \text{Ev BECOME ([Th the ice],[Prop melted])] \]
  
b. John melted the ice.
  \[ \text{Ev CAUSE([Ag John], BECOME([Th the ice],[Prop melted])])} \]
  
c. John built the house.
  \[ \text{Ev CAUSE([Ag John], BECOME([Th the house],[Prop built])])} \]

- **ACHIEVEMENTS**
  
a. The glass broke.
  \[ \text{Ev BECOME([Th the glass],[Prop broken])} \]
  
b. John broke the glass.
  \[ \text{Ev CAUSE([Ag John], BECOME([Th the glass],[Prop broken])])} \]
Events as part of general lexical-conceptual structure

- Controversial nature of the primitive predicates:
  - **BECOME** is the only inherently aspectual function.
  - **ACT/DO**: agentive; is used to represent ACTs, but there are non-agentive ACTs:
    - *The ball is rolling / It is raining*
  - **CAUSE**: causative; used to represent ACCs and ACHs, but:
    - There are causative predicates that denote ACTs: *John walked his dog (for an hour)*.
    - There are non-causative ACCs and ACHs: *The ice melted in ten minutes / A brilliant idea emerged in her mind*
  - The primitive predicates cannot be quantified.
An independent level of Event Structure

- Pustejovsky (1988, 1991, 1995), Grimshaw (1990): ES as a level of representation that is distinct from the representation of other lexical properties (AS), although it is related to them.

- Event typology (Pustejovsky 1995)
  - **State**: simple event evaluated without referring to other events: *be sick, love, know*
    
    \[
    S \xrightarrow{e} \text{be sick, love, know}
    \]

  - **Process**: sequence of events identifying the same semantic expression: *run, push, drag*
    
    \[
    P \xrightarrow{e_1 \ldots e_n} \text{run, push, drag}
    \]

  - **Transition**: event identifying a semantic expression evaluated with respect to its opposition: *give, open; build, destroy*
    
    Two-state transition (ACH):
    
    \[
    T \xrightarrow{S_1 \text{ } S_2} \text{give, open; build, destroy}
    \]

    Extended transition (ACC):
    
    \[
    T \xrightarrow{P \text{ } S} \text{give, open; build, destroy}
    \]

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An independent level of Event Structure

Subvents are ordered by:

- **Temporal relations**: strict precedence ($<_m$: build, arrive, give) or overlap ($\circ$: sell, buy, marry)
- **Headedness**: what part of a complex event is the focus of interpretation and is ‘syntactically highlighted’
  - a. The destroyer is sinking the boat. [P*$<_m$S]
  - b. The destroyer sank the boat. [P$<_m$S]*
  - c. The boat sank. [P$<_m$S*]
An independent level of Event Structure

- AS-ES relation: “each subevent must be associated with at least one argument position at lexical structure” (Pustejovsky 1991)

\[
\begin{align*}
\text{sink} \\
\text{AS} &= \begin{cases} 
\text{ARG}_1 = x & \text{CAT} = \text{DP} \text{, SEM TYPE} = \text{humanph obj event} \\
\text{SEM TYPE} = \text{phys obj} \\
\text{ES} &= \begin{cases} 
\text{E}_1 = \text{process} \\
\text{E}_2 = \text{state} \\
\text{e}_1 < \text{e}_2 \\
\text{QS} &= \begin{cases} 
\text{AGENTIVE} = \text{sink}_\text{act}(\text{e}_1,x,y) \\
\text{FORMAL} = \text{sink}_\text{result}(\text{e}_2,y)
\end{cases}
\end{cases}
\end{align*}
\]
An independent level of Event Structure

- Subevents can be quantified in the logical form of the sentence, in the same way that arguments can be.
  - *The destroyer is sinking the boat.*
    $\exists e_1 \exists x \exists y [\text{sink}\_\text{act}(e_1, x, y) \land \text{destroyer}(x) \land \text{boat}(y)]$
  - *The destroyer sank the boat.*
    $\exists e_1 \exists e_2 \exists x \exists y [\text{sink}\_\text{act}(e_1, x, y) \land \text{destroyer}(x) \land \text{boat}(y) \land \text{sink}\_\text{result}(e_2, y) \land e_1 <_m e_2]$
  - *The boat sank.*
    $\exists e_2 \exists e_1 \exists y \exists x [\text{sink}\_\text{result}(e_2, y) \land \text{boat}(y) \land \text{sink}\_\text{act}(e_1, x, y) \land e_1 <_m e_2]$
  - *The boat is sunk.*
    $\exists e_2 \exists y [\text{sink}\_\text{result}(e_2, y) \land \text{boat}(y)]$
Event Structure with a dimension of scalar change

- **Dynamic Event Structure (DES)**: ES enriched to track dynamically object attributes modified in the course of the event (Pustejovsky and Moszkowicz 2011).

- All the events are represented as a sequence of states related by functions (programs) which go from state to state.

\[
\begin{align*}
\text{a. State} & , \quad e^i \rightarrow \varphi \\
\text{b. Process} & , \quad e^{[i,j]} \rightarrow e_1^i \rightarrow \alpha \rightarrow \cdots \rightarrow e_n^i \rightarrow \varphi \\
\text{c. Achievement} & , \quad e^{[i,i+1]} \rightarrow e_1^i \rightarrow \alpha \rightarrow -\varphi \\
\text{d. Accomplishment} & , \quad e^{[i,j+1]} \rightarrow e_1^{[i,j]} \rightarrow \psi \rightarrow e_2^{[j+1]} \rightarrow -\psi
\end{align*}
\]

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Event Structure with a dimension of scalar change

- Two-dimensional geometric analysis (Croft 2012):
  - \( q \) axis: qualitative phases or states that make up the event
  - \( t \) axis: how these phases unfold in time.
- Event types are differentiated depending on two criteria:
  1. Does the event/subevent span a point or an interval on either dimension?
  2. Which phases of the event are profiled (explicitly asserted to hold at a particular point in time) and which ones are presupposed or entailed by the profiled phase(s)?

  a. Achievement
     \( \text{The boat sank (at noon).} \)
  b. Irreversible resultant state
     \( \text{The boat is sunk.} \)
  c. Incremental accomplishment
     \( \text{The boat is sinking.} \)

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Scalar properties of events

- **Scale**: set of ordered degrees representing a specific attribute (size, position, price, etc.)
- Scalar properties of events: the event denoted by the V does not affect the entity denoted by its argument as a whole but rather one of its specific properties, which is being progressively altered as the event unfolds.
  a. John ate a sandwich.
     **Physical extension, consumption predicate**
  b. John wrote a book.
     **Physical extension, creation predicate**
  c. John approached Mary.
     **Spatial location (Path), directed motion predicate**
  d. The balloon rose five meters.
     **Spatial location (Path), vertical motion predicate**
  e. The gap widened six inches.
     **Secondary attribute (adjectival), gradual achievement predicate**
Scalar properties of events

- The properties of the scale lexicalized by the predicate to determine its aspect, e.g., in deadjectival gradual achievement Vs (Hay et al. 1999, Kennedy and Levin 2008).

- Scalar classes of adjectives:
  a. Open scales
     *totally/*somewhat {wide/ long/ deep}
  b. Totally closed scales
     totally/somewhat {empty/ open/ visible}
  c. Lower closed scales
     ?totally/somewhat {wet/ dirty/ sick}
  d. Upper closed scales
     totally/*somewhat {straight/ clean/ flat}
Scalar properties of events

- Multi-valued scales can yield durative atelic (weakly telic) predicates denoting a non-maximal degree of change:
  a. John is widening the gap. ⇒ John has widened the gap somewhat.
  b. John is emptying the tank. ⇒ John has emptied the tank somewhat.
  c. Jaco is dirtying the floor. ⇒ Jaco has dirtied the floor somewhat.
  d. John is flattening the wire. ⇒ John has flattened the wire somewhat.

- Predicates based on a partially or totally closed scale can have a telic interpretation conveying that one of its bounds has been reached:
  a. #John widened the gap completely and now the gap is wide. [with respect to a previously planned width]
     open scale, a contextually-relevant scale limit provided for telic reading
  b. John emptied the tank completely and now the tank is empty. totally closed scale, upper degree is involved in telic reading
  c. Jaco dirtied the floor (*completely) and now the floor is dirty. lower closed scale, lower degree is involved in telic reading
  d. John flattened the wire completely and now the wire is flat. upper closed scale, upper degree is involved in telic reading

- 2-valued scales → [-durative] [+telic] predicates.
Eventive readings of adjectives

- Events are usually denoted by Vs, but Adjs and Ns may have eventive properties, too.

- Properties may be either *temporally* or *atemporally* associated with an individual object.
  
  - **Individual-level (IL) predicates** encode inherent properties of an individual, which persist in time and are associated with it during all or most of its existence.
  
  - **Stage-level (IL) predicates** describe specific states of an individual, linked to external circumstances or to specific temporal and spatial coordinates.
SL/IL diagnostics

1. Presentational ‘there’: ‘there are x entities that have property P’
   a. There are too many people {hungry/ tired/ alert}. SL
   b. *There are too many people {boring/ intelligent/ respectful}. IL

2. Complementation with specific predicates: consider and see.
   a. I consider him {boring/ intelligent/ respectful/ *hungry/ *tired/ *alert}.
   b. I saw John {*boring/ *intelligent/ *respectful/ hungry/ tired/ alert}.

3. Only SL adjectives can be subject predicative complements (‘x did something, and x had property P when x did it’).
   a. John came home {*boring/ *intelligent/ *respectful/ hungry/ tired/ alert}.

4. Only SL predicates are freely compatible with temporal and spatial modifiers
   a. *John is {boring/ intelligent/ respectful} {in London/ this year}. (IL+temporal/spatial)
   b. John is {hungry at his office/ tired at home/ alert in the classroom}. (SL+spatial)
   c. John is {hungry in the evening/ tired after work/ alert after the accident}. (SL+temporal)
Aspectual interpretation of the IL-SL distinction

- IL properties have no temporal boundaries
- SL properties are bounded in time
  - *dead*: only left boundary
  - *sick, hungry, tired*: compulsory left boundary and an optional right boundary
IL-SL: specific cases

- Adjectives compatible with both contexts:
  a. There are many people \{happy/ pretty/ fat/ anxious\}. SL
  b. I consider him \{happy/ pretty/ fat/ anxious\}. IL
  c. I saw Mary \{happy/ pretty/ fat/ anxious\}. SL
  d. Mary came back home \{happy/ pretty/ fat/ anxious\}. SL

- *Ser-estar* ambiguity in Spanish
  - Juan \{es/ está\} \{feliz/ guapo/ gordo/ ansioso\}. IL/SL
    Juan is \{happy/ hansom/ fat/ anxious\}.

- Adjs showing eventive, dynamic behavior: in (c)-(d), they describe a property of events rather than individuals:
  a. There are too many people \{unfaithful/ polite/ brave/ careful\}. SL
  b. I consider him \{unfaithful/ polite/ brave/ careful\}. IL
  c. What happened is that John was \{unfaithful/ polite/ brave/ careful\}.
  d. John is being \{unfaithful/ polite/ brave/ careful\}. 

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Eventive readings of nouns

- Both underived and deverbal Ns can denote events (war, riot, party; destruction, preparation) and event participants (surgeon, fan, knife, furnace; conqueror, boiler, hanger).

- Deverbal Ns can display verbal and nominal properties in varying degree.

- Two main classes of deverbal nominals (Grimshaw 1990):
  - Event-denoting
  - Individual-denoting
Event-denoting deverbal nominals

a. The *rehearsal* of the play for many weeks paid off at the premiere. ACTIVITY

b. The *preparation* of the banquet in just two hours amazed the guests. ACCOMPLISHMENT

c. The frequent *assassination* of politicians by guerrillas was shocking. ACHIEVEMENT

d. John’s *admiration* for his new colleague’s discretion did not last long. STATE
Individual-denoting deverbal nominals

- Can denote
  - Event result
    - agreement/referral/mixture: can denote the result of agreeing, referring, and mixing, but they are not related to the DO of the base V and may or may not denote created objects.
  - Event participants
    - Agent (translator, smoker)
    - Theme (appointee, attachment)
    - Instrument (opener, washer)
    - Place (hanger)
- Usually reject modification by aspectual and temporal adverbials:
  a. #\{frequent/constant\} \{agreement/referral/mixture\}
  b. #parties’ agreement \{in/for\} two months, \{doctor’s referral/chef’s mixture\} in five minutes
  c. *\{frequent/constant\} \{translator/opener/hanger\}
Individual-denoting deverbal nominals

- Some participant nominals do have interpretations involving the underlying event:
  a. \{frequent/occasional\} \{flyer/smoker\}
     *frequent/occasional* applies to the event, not person
  b. Over two million flyers chose our company this year.
     Two million \{flying events/customers\}
  c. the flyer in the first row of the aircraft/ *the flyer \{on the sidewalk/at home\}

- Modal nominals: *translator, opener*

- Extensional nominals: *smoker, flyer*


