1. Introduction: Cause and Effect, linguistically

**Causation:** cause-effect relationship as a cognitive and experiential universal

**Causativity:** grammaticalized causation in different languages
Cognitive universal: establishing cause-effect relationships  
→ causation
Linguistic universal: grammaticalized in all languages  
→ causativity

Systematic grammaticalization in different languages can reveal rules that govern conceptualization differences

1.1 Acquisition of causation

Acquisition of causation: > 7 months of age (Spelke, 1995)
Acquisition of causativity: L1; 36 months of age (Gelman/Koenig, 2001)
1.2 Speaker interpretation of causal relationships

1. mapping the constituents (causer/causee) onto conceptual prototypes
2. recognizing the temporal order of the antecedent (cause) and consequent (effect) due to human temporal processing

Causation: anchored primarily in verbs (causatives)
Causal “force” (Langacker, 2002): expressed with analytic/auxiliary, morphological and lexical features
→ lexicalised as two clauses or conflated into one clause

2. Biclausal causativity
→ preserves the temporal order of the events, cf.

(1) John kicked the ball and the ball demolished the window
coordinating conjunction: establishes temporal seriality
reversal of cause clause/effect clause with conjunctions like because:
(2) The window broke because John kicked a ball through it
2.1 Epistemic causality

infant speech

(3)  a. It rains because the street is getting wet
epistemic (= referring to speaker’s knowledge) because it can be interpreted as:
(3)  b. I notice that it rains because the street is getting wet.

2.2 Strategies of extraposition

- cleft sentences, cf.
(4)  It was John who demolished the window

3. Monoclausal causativity

Cline from two different verbal elements to conflation into one verb

3.1 Complex verbal proposition

(5)  John made us suffer,
3.2 Simple proposition (the "effect")

(6) The bottle broke
→ Causal situation: grammaticalized as either one single event, one complex event or a sequence of separate, causally related events (action chain) with the following component events:

(7) a. John made Mary read the text
→ causing/precipitating event + caused event

(7) b. John “brought it about that” + Mary read the text
Degree of fusion leads to different types of causatives (grammaticalization types)
3.3 Grammaticalization types of causation

a) periphrastic (make/have/let/get)
b) morphological (soften, enable)
c) lexical/inchoative (break, develop, drown…)
d) lexical/suppletive (kill, repair)

3.4 Periphrastic causatives

(8) I make/have/let/get John (to) clean the kitchen

Causative have invites multiple ambiguities, as in

(9) I almost had my wallet stolen (Higginbotham, 1995)
Class 02; Oct 16, 2007

1.1 [continued] Periphrastic/analytic causatives

Generative approach: all languages allow incorporation of causative verb within the verb complex:

causative sentence

(1) John opened the door (at time t)    has the entailments

    The door was not open (before t)
    The door was open (at or after t)
    John was involved in some event
    If John had not done it the door would not have opened

→ pattern is characteristic of accomplishment verbs, therefore they indicate (but do not prove) membership as causatives
1.1.1 Generative semantics: semantic structure of the sentence (ex. by Dowty):

![Diagram of the sentence structure]

**semantic interpretation:** BECOME interpreted as tense operator
is true at t but false at a previous moment
CAUSE interpreted as sentence connective

x CAUSE y is the case in some world I iff x and y are the case in I
(and in a possible world most similar to I, –x is the case and –y)
1.1.2 Periphrastic vs. “narrow” causatives

only class of narrow causatives allows *make*-paraphrase

(2) \( V_t \) \( V_i \)
\[
\begin{align*}
\text{a. John makes Bill drown} & \quad \text{Bill drowns} \\
\text{b. Jane makes the pot break} & \quad \text{The pot breaks} \\
\text{c. We make the wood split} & \quad \text{The wood splits} \\
\text{d. John makes Bill happy} & \quad *\text{John happies Bill}
\end{align*}
\]

but

\[
\begin{align*}
\text{d. John makes Bill happy} & \quad *\text{John happies Bill}
\end{align*}
\]

thus: \( *\text{make} + A \) via morphological modification

(3) John makes Bill sad \( \rightarrow \) John saddens Bill \( \quad ? \) Bill saddens
1.2 Morphological causatives

consist only of one predicate, e.g. electrify, whiten, deflate
causal power has influence on state/properties of objects

**formation**: $V_i$ derived from deadjectival $V_i$

- e.g. enrich (rich), soften (soft), strengthen (strong),
  actualize (actual)

→ nonproductive, exception: –lize

1.2.1 Causative continuum

lexical, suppletion A + morpheme zero-modification

$kill/die$ actualize move

zero-modification: frequently adjectival

(4) He warms the milk $V_i/t$ + caus: A + -en e.g. soft $\rightarrow$ soften

(5) She softens the surface
1.2.2 Formation aberrations

(6) a. Mary makes the fly dead  *Mary deads the fly  *The fly deads/deadens
   Mary kills the fly  *The fly kills

   b. John makes tea cool  John cools the tea  The tea cools
   c. Sue makes the tree fall  Sue fells the tree  The tree falls/*fells
2. Causation and temporality

sender implies causality, receiver retrieves implied message via Gricean terms
→ unmarked temporality implies causality

2.1 Temporal representation
Lascarides: logical framework that contains receiver's knowledge of causal relations together with knowledge of syntactic structure, semantic content and aspectual classification

(7) reflects this while (8) distorts it:

(7) John hit Max. Max turned round
(8) Max turned round. John hit him

(8) distorts it in the "null" context

thus: order in which such clauses appear is crucial (Lascarides, 1992)
2.2 Ordering constraint

given a particular order in which events are described, what are the **constraints in interpretation** on their temporal and causal relations in the world?

**Ordering constraints** are satisfied if the textual order of simple past tensed clauses reflects the temporal order
But: constraint unnecessary, cf.

(9) The council built the bridge. The architect drew up the plans
(10) Max fell. John pushed him

second event in (9) doesn't follow first event,
second event in (10) precedes first event
1.3 Temporality constraint

event and state in (11) temporally overlap, in (12) they do not

(11) Max opened the door. The room was pitch dark
(12) Max switched off the light. The room was pitch dark

2.4 Implicit biclausal constructions with heterogeneous markers

(13) He was too tired to walk (ex. by Vandepitte) / He was reluctant to walk

causal object constructions:
(14) a. John was clever to beat Paul
b. I'll be happy to hear from you

according to principle of relevance, the causal interpretation is the most relevant interpretation
1. Morphological causatives – productivity test
2. Further causative forms in English

2.1 Lexical means, cf. Vandepitte, 2003

cause, lead to, entail, enable, induce, effect, engender

or: make + x + adj + to-inf

(1) They made it impossible to continue

other lexical means: due to
as
by analogy with
considering
in front of
in the light of
to
2.2 Causative conjunctions

usually combine two finite clauses

explicit: because, since, so that, hence, thereby
implicit: after all, otherwise, somehow

Causative ontology according to Vandepitte:

1) Causality is seen as a general concept of human experience

but: 2) it is not commonly accepted whether it is a linguistic category
3. Grammaticalization of causativity

3.1 Definition Grammaticalization:

- change in a language over time by which a word/a construction loses its original meaning and becomes a grammatical marker (Trask, 1997)

- lexical forms assume grammatical functions (Heine, 1997)

- process of forming of grammatical morphemes out of lexical morphemes (Bybee, 1990)

English: different means to express causation motivated by

→ inclusion hierarchy of causal expressions

→ causation has basic dimensions of meaning:

   CAUSE, ENABLE, PREVENT
4. Semantic core of causation

CAUSE: creates family of concepts including ENABLE, PREVENT

**concept differences**: via

patterns of tendency,
relationship strength,
rest or motion between causer and causee

<table>
<thead>
<tr>
<th>causee result tendency</th>
<th>causer-causee-agreement</th>
<th>result occurs?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAUSE</strong></td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>ENABLE</strong></td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>PREVENT</strong></td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

Tab. 1: Semantic dimensions of causation (adapted from Wolff, et al. 2003)
(2) a. Wind caused the bridge to collapse
   → Bridge does not tend to collapse
   b. Vitamin B enables the body to digest food
   c. Oil prevents butter from burning

**semantic spectrum:**
- affect verbs
- link verbs
- conjunctions/prepositions
- periphrastics
- lexical causatives
- resultatives
**semantic variables:**
- change of state of causee
- end state specified or not
- tendency of cause
- agreement causer – patient
- direct or indirect causation
- means or mechanisms given

→ **resultatives:**
- have most meaning components
- give mechanism
  - directness
  - agreement
  - endstate

(3) John wiped the slate clean (with a towel)
4.1 Spectrum of causatives in English

affect verbs: *affect, influence, determine, change*

- causer precipitates change in causee
- nature of change is not specified
→ can be replaced with *cause, enable, prevent*

(4) a. Fires affect biodiversity
    b. Fires cause biodiversity
    c. Fires enable biodiversity
    d. Fires prevent biodiversity

(examples cf. Wolff, et al., 2003)
1. Spectrum of causatives in English (continued)

Wolff et al.’s hierarchy: affect, link, conj&prep, periphrastics, lexical causatives, resultatives

1.1 Affect verbs

*affect, influence, determine, change*

- causer precipitates change in causee
- nature of change is not specified
→ can be replaced with *cause, enable, prevent*

(1) Laws of nature cause/enable/prevent celestial movement

1.2 Link verbs
- specify that result is achieved
- separate cause/enable from prevent

(2) a. An earthquake was linked (caused, enabled) to a (by a) tsunami
   b. *An earthquake was prevented by a tsunami

(3) a. CIA failure led to/caused/enabled 9/11
   b. *CIA failure prevented 9/11
   c. CIA failure prevented investigation success

Wolff: cause + enable is valid, therefore distinction is not semantically encoded in link-V
→ part of world knowledge (cf. also Vandepitte, 2003)
1.3 Causative conjunctions and prepositions

- do not express preventive causation

conjunctions: causal (*because, since*)
  temporal (*after, when*)
  conditional (*if*)

→ causal subordinators introduce **reason-clause**
- reasons are metaphorical extensions of causes

(4) a. Liam left the house after the cops arrived
    b. Liam left the house when the cops arrived
    c. Liam left the house when he was told that the cops had arrived
causally inequivalent:

d. The cops arrived before Liam left the house
Clark/Clark 1977: subordination relation is critical for causal reading
→ if result is subordinated, the sentence loses its causal interpretation

e. The cops arrived and (promptly) Liam left the house

conditional *if*:

(5) a. If the engine works we will start manufacturing
problem case modality: if *x* happens, *y* *can/could/may* ...

→ no cause/enable differentiation:

(5) b. We started manufacturing after the engine was repaired
   c. Repairing the engine caused /enabled us to start manufacturing
cause/enable differentiation:

(6) a. Go to Spain and have a good time → ENABLE
    b. I was too busy so I forgot about the paper → CAUSE
1.4 Periphrastic causatives
- use two or more predicate terms
  - main verb is complemented with DO and embedded clause, 2nd clause → result

ternary (3-way) distinction scheme

(7) a. The teacher made us read the book
    b. The teacher caused us to read the book
    c. The teacher let us read the book
    d. The teacher enabled us to read the book

→ force dynamics: distinction if result occurs
- causee tendency for result and agreement
1.5 Lexical causatives

- full grammaticalization of CAUSE (fused)
  → imply cause and encode result, cf. break
- includes many phrasal V (turn off, knock down…)

test: causative-inchoative alternation

(8) Joe broke the glass    -    The glass broke

subclassifcation according to type of result:
  change of state         awake, balance, bend, burn
  change of location, in particular manner     bounce, drift
1.6 Resultatives

(9) a. Mary laughed herself mad
    b. Mary caused herself to become mad by laughing

→ cause event + subevent unfold together, are temporally dependent
    - result is encoded in verb

→ result V can therefore encode manner/means of causation
   *(dusted/blew/wiped/swept the table clean)*
Summary:

semantic classification shows **underlying semantic system**
→ inclusion hierarchy exists
   but: does semantic system reflect conceptualisation of causation?
   → crosslinguistic perspective is important

Conclusion:

causative relationship taxonomy resembles nominal taxonomies
   - periphrastic causatives are "structurally complete"
   - lexical causatives: most privileged, most frequent, acquired earliest
1. Resultative verbs

1.1 Definition

A piece of a sentence identifying the result of the action named in the sentence, cf. *I painted the bathroom blue* (Trask 1997: 188)
1.2 Varieties of resultatives

1.2.1 Transitive resultatives

- base V is transitive

(1) a. The author read the pages loose
    b. The bartender ground the ice cubes to mush
    c. They painted their bathroom green

1.2.2 Intransitive resultatives

- base V is intransitive

(2) a. The joggers ran their Nikes threadbare        (example by Carrier/Randall, 1992)
    b. The guys giggled themselves into a coma
    c. Mira sat her chair completely flat

→ categorization based on the nonresultative counterparts *(The guys giggled* etc.)*
2. Syntactic structure of resultative verbs

**question:** Is result-constituent (*loose, threadbare*) an argument?
→ if argument, it must be valency-bound/theta(θ)-marked by verb, receives role from verb

**2.1 The Small Clause problem**
transitives: the postverbal NP (e.g. *the pages*) is an argument
intransitives: the postverbal NP cannot be an argument

tree structure: they must be parallel nodes (sisters), e.g. on same level to be arguments

typical Small Clause (non-resultative):

(3) The advisors wanted their king dead
2.2 Binary (2-way) branching

\[ \text{VP} \quad \text{VP} \]

want the king dead

read the pages loose

run their Nikes threadbare

2.3 Ternary (3-way) branching

\[ \text{VP} \quad \text{VP} \]

\[ \text{→ difference in branching leads to different argument structures} \]
3. Argument structure of ordinary verbs

(4) We put the flowers into the vase

*put* Agent [Theme Goal] → 3 obligatory arguments, one external (S)
two internal (O) (Goal receives role not from but from P)

*loose* Theme [ ] → Theme position is external
3.1 Argument structure for binary analysis

*pages* \text{AGENT [THEME]} \rightarrow \text{the pages} not sister anymore to \text{V}, thus it is not its argument and cannot receive its \text{\theta}-role from it
- could only assign the role to entire SC constituent

<table>
<thead>
<tr>
<th></th>
<th>basic V</th>
<th>resultative V</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>pages</em></td>
<td><em>AGENT [THEME]</em></td>
<td><em>AGENT [RESULT-EVENT]</em></td>
</tr>
<tr>
<td><em>run</em></td>
<td><em>AGENT [ ]</em></td>
<td><em>AGENT [RESULT-EVENT]</em></td>
</tr>
</tbody>
</table>
3.2 Argument structure for ternary analysis

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<td>AGENT [RESULT-STATE]</td>
</tr>
<tr>
<td>run</td>
<td>AGENT [ ]</td>
<td>AGENT [RESULT-STATE]</td>
</tr>
</tbody>
</table>
3.3 Difference in interpretation

ternary structure: if postverbal NP in transitive is argument of V then the resultatives should have transitive meanings

Interpretation:  As a consequence of the author reading the pages, the pages became loose

binary structure: not really a transitive

Interpretation:  As a consequence of the author engaging in the activity of reading the pages, the pages became loose

→ in ternary analysis the pages receive θ-role from read and from loose
→ in all intransitive cases the postverbal NP receives the θ-role from adjective
Class 06; Nov 13, 2007

1. Evaluation test results (selection)
2. Argument structure for resultatives [continued]

2.1 Double $\theta$-role assignment

\[ \text{VP} \]
\[ | \]
\[ V \quad | \quad NP \quad | \quad AP \]
\[ | \]
\[ \text{read} \quad | \quad \text{the pages} \quad | \quad \text{loose} \]

→ in ternary analysis we find a different argument structure
- argument structure and syntax = **not isomorphic**

→ being a sister node of a V does **not entail** being an argument of the V
2.2 Argumentation for the result predicate

Result predicates can be
AP
(1) They painted the house green
PP
(2) He broke the glass to pieces
NP
(3) They painted the house an eerie green

cf. *He broke the glass pieces
reason: result XP must be a state

→ pieces does not designate a state

thus constraint for AP:  deverbal -ing, -ed A are ungrammatical
non-deverbal –ed can be grammatical
2.3 Transitive resultatives and states

(4) a. The butler polished the silver shiny
   b. *The butler polished the silver shining/shined

(5) a. John smoked the bedroom walls black
   b. *John smoked the bedroom walls blackened
2.4 Intransitive resultatives and states

(6) a. Tracy ran herself sweaty
    b. *Tracy ran herself sweating
    c. Tracy ran herself exhausted

→ semantic constraint: aspectual clash between meaning of resultatives and meanings of deverbal –ing, -ed A

but cf.:

(7) Tracy found herself sweating
3. The acquisition of argument structure

3.1 The parametric, Chomskyan perspective
- parameter setting requires “accumulation of sufficient linguistic experience to enable the relevant parameters to be set at the appropriate values”, (Radford, 1990)

vs.

3.2 Data-driven acquisition
- disregard parameters in favor of pattern-induced learning
- hypothesize a 2-stage model of verb acquisition
  **first stage:** learned on the example (verb-specific acquisition)
  **second stage:** involves a generalization of transitivity (Akhtar, 2001)
3.3 Generalization of transitivity
to some extent involves overgeneralization of causativity
cf. infant speech errors like

(8) *You cried her! (cf. Brooks, 1999)

→ explanation: majority of verbs in parent speech are simple transitives referring to concrete items as subjects/objects in the vicinity of the infant

- many verbs have transitive as well as intransitive use
  → allow causative-inchoative alternation

- overgeneralization works in both ways

(9) *I think I better put it down there so it won’t lose (Lord, 1979)

novel uses involving suppletion like
(10) *Did you sound that? (ibid)
1. Verbs of Change

1.1 Types of secondary predication (terminology cf. Rothstein, 2004)

Two types: resultative and depictive predication
- secondary predicates are aspectual modifiers
→ introduce new event and define a relation between it and the event introduced by the main predicate

1.2 Canonical cases of depictive and resultative predication

(1) a. John drove the car drunk (depictive) subject-oriented
    b. Mary drank the coffee hot (resultative) object-oriented
    c. John painted the house red (resultative) object-oriented

all examples: Rothstein, 2004
1.3 Object-predication vs. subject-predication

Simpson, 1983: resultatives can be predicated only of $O_{dir}$, cf. (1c.)
→ result: *house is red, not John
but cf. intransitives, reflexives as non-thematic objects

(2) a. John laughed himself sick
   b. *John ran Mary drunk

→ 2b. cannot have reading: *John ran while Mary was drunk

**assumption:** object-oriented secondary predicates (resultatives) are generated under $V'$
subject-oriented secondary predicates (depictives) are generated under $VP$
structure:

John drove the car drunk       Mary drank the coffee hot
1.4 Structural arguments

test 1: pseudo-clefting
subject-oriented secondary predicates become stranded
object-oriented secondary predicates are never stranded because
they are daughters of V’

(3) a. What Mary did was paint the house drunk
b. What Mary did drunk was paint the house
c. What Mary did was drink the coffee hot
d. *What Mary did hot was drink the coffee
test 2: secondary predicates do not form a constituent with their subject
→ if object-oriented predicate and its subject formed a constituent then that subject would be the $O_{dir}$ of the matrix verb as in small clauses
→ SC constructions have different entailments

(4) a. Mary believes John foolish does not entail Mary believes John
   b. Mary drank her coffee hot entails Mary drank her coffee
   c. Mary painted the house red entails Mary painted the house

Test: negation of matrix verb

(4) d. John believes Bill a liar and he doesn’t believe Bill
2. The semantics of verbal situation types
2.1 Basic events

(1) a. Mary burned the book
   b. Mary liked the book

event 1: well-defined boundaries in time, sequence that comprises event can be sequentially portrayed in time:
   internally heterogeneous, component events are all different, is dynamic

event 2: not clearly defined boundaries
   internally homogeneous; started in past, open if it still continues, is stative

→ perfective situations: bounded events - states
   imperfective situations: unbounded events - processes
3. Verbal quantification

Internal structure of propositions can be quantified:
→ Aspectual classes (Vendler, 1967)

3.1 Aspectual classes

1. activity (to run, to push a cart)
2. accomplishment (to run a mile, to draw a circle)
3. achievement (to win a race, to reach the summit)
4. state (to like somebody, to hate something)

→ Classes define the telicity or atelicity of events (from telos <Greek>: goal)
3.2 States

- static, unchanging situations or qualities (emotional, physical)
- are continuous over period of time, can answer the question, how long?

Properties: no progressive
no imperative
no “finish”

*Lisa is hating it
Like this book!
*I finished believing it vs.
I started/stopped believing it
3.3 Activities

- dynamic situations, can persist indefinitely, no defined endpoint
- have no definite end, can answer the question, *how long?*

**Properties:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>progressive</td>
<td><em>We were observing the entrance</em></td>
</tr>
<tr>
<td>imperative</td>
<td><em>Watch this movie!</em></td>
</tr>
<tr>
<td>voluntary</td>
<td><em>I’m deliberately looking at the picture</em></td>
</tr>
<tr>
<td>unvoluntary</td>
<td><em>Our plant is growing</em></td>
</tr>
</tbody>
</table>

→ If the plant stops growing, it has grown
3.4 Accomplishments

- dynamic situations with a defined endpoint/climax
- endpoint must be reached, can answer the question, how long?

Properties:

- have “finish”
  - happen in X time
  - do not happen for X time

John finishes writing the letter
She recovered from the flu in 2 weeks
She recovered from the flu for 2 weeks

→ If John stops writing the letter, he has not written it
3.5 Achievements

- dynamic situations, occur instantaneously
- punctual events in which a state changes, can answer the question, *at what time?*

**Properties:**
- type A: instantaneous
- type B: culmination phase

*We reached the summit*
*We found a solution*
1. Referential dependencies with verbs
1.1. Testing ground reflexive anaphors

(1) a. He can feel proud of himself
    b. *She can feel proud of himself
    c. *Herself went to the store

- reflexive anaphors: receive reference from **antecedent**, are **bound by antecedent**
- unbound anaphors: → ungrammatical sentences
Structural constraints:

(1) d. Edna will not hurt herself
   e. *Friends of Edna will not hurt herself

→ structural position decides on binding

Binding c-command condition:

A bound constituent must be c-commanded by an appropriate antecedent
→ e) Edna does not c-command herself, herself remains unbound → ungrammatical
1.2 Binding Principles of Binding Theory

**Principle A:** An anaphoric NP must be bound in its governing category

**Principle B:** A pronominal NP must be free in its governing category

**Principle C:** A lexical NP must be free
2. General remarks on psych verbs

2.1 Definition

**Psych verbs:** Verbs of psychological states with *experiencer objects*, e.g. *amuse, worry, anger*

2.2 Properties: different accounts
2.2.1 The Belletti/Rizzi account (Belletti/Rizzi 1988, 1991)

$\theta$-assignment problems; → psychV do not form verbal passives, passivizations are adjectival

→ have special d-structure, are unaccusatives, cf. backward anaphora as in

(2) a. Pictures of himself$_i$ worry John/him$_i$

b. *Himself$_i$ worries John/him$_i$
2.2.2 The Grimshaw account (Grimshaw, 1990)

- distinction between agentive and non-agentive psychV

→ non-agentive *frighten*-verbs do not form verbal passives but adjectival passives

agentive *frighten*-verbs do form verbal passives

→ psychV have no external arguments, therefore complex event nominals of psychV are ungrammatical

(3) *The movie's constant amusement of the children*
2.2.3 The Pesetsky account (Pesetsky, 1995)

- rejects Grimshaw’s account, not agentivity is the parameter but \textit{presence of implicit causer}

$\rightarrow$ adjectival passives are stative in meaning

\textbf{argumentation:} adjective cannot be substituted with passive participle \textit{thus it is not adjectival}

(4) a. The car is washed/The washed car
    b. The clown is funny/The funny clown
    c. *The clown needs funny
but **eventive readings:**

(4) d. The car needs washed  
   e. The car needs washed very carefully
   → verbal passive reading possible

**negative un-** attaches to A but not to passive participles:

(4) f. *The car needs unwashed
degree modifiers like much

much: stative reading, forces an adjectival passive interpretation

(4)  g. The car was much washed when Rita owned it
    h. *The car needed much washed when Rita owned it

cxt context manipulation to emphasize agentivity

(5)  a. Susan enjoys pleasing her sister, she thinks her sister needs pleased
    b. *Susan enjoys depressing her sister, she thinks her sister needs depressed
       (examples by Tenny, 1998)
2.2.4 The Iwata account (Iwata, 1995)
- distinctive character of psych-verbs lies in reduced saliency of the causative process
  → not to be attributed to lack of d-structure subject or lack of an external argument

3. Syntactic argumentation of psych verbs
Iwata: doubtful that psychV have special D-structure
argumentation:

3.1 Interpretation

(6) Sue frightens easily

Two readings: A at smallest provocation (derived from non-agentive psychV);
  B anyone can frighten her (derived from agentive psychV)
3.1 Adjectival morphology

*ed-adjectives* (adjectival passives): predicated from direct internal argument of base \( V \)
→ psych\( V \) behave like any transitive \( V \)

(7) a. The movie pleased/amused/annoyed the audience
    b. the pleased/amused/annoyed audience
    c. *the pleased/amused/annoyed movie

→ explainable via direct/indirect argument distinction
**able-adjectives:** predicated from direct internal argument of base V

(8) a. I like annoying John. He is so annoyable
    b. I like annoying John. *I'm so annoyable

Iwata, 1995: psychV are lexical causatives
    with **primacy on resultant state** and
    low saliency of causative process
1. Causer/Causee issues and control

**Causer:** agentive, controlling component of the causal situation

**Causee:** recipient of the causer action and initiator of precipitated action

→ some degree of control

1.1 Lexical causatives

**Suppletion** (= replacing) instead of morphological derivation → rather **unsystematic**

(*kill/die*)

English: some causatives without morphological change: **asymmetrical**

(1) a. John tried to melt/break the ice/the twig but it wouldn't
   
   b. *John tried to kill Mary but she wouldn't

→ ex. a formal, **non-productive** relationship
1.2 Semantic parameters

direct causation vs. indirect causation

→ problem of degree of control of causee in macroproposition
→ problem of distinction between true causation and permission

(2) a. I made the vase fall (causation)
b. I let the vase fall (permission)

- morphologically rich languages: causative/permissive morpheme is the same (cf. Georgian, Comrie, 1989)
2. Causer-Causee relationship

- anterior event/agent has control over whether or not the effect is realised
  → if permissive, agent has control to prevent it

**Causation-permission distinction**: related to mediacy of cause-effect
  → this mediacy distinction is grammaticalized in many languages

therefore: analytic- morphological – lexical continuum correlates
  with a direct – indirect continuum
2.1 Mediacy in causation

situation indication where there is mediacy:

(3) a. He dried the bread  (e.g. in the oven)
    b. He let the bread dry  (e.g. he forgot to cover it)

(examples by Comrie, 1989)

→ Comrie: difficult to have only a direct or only an indirect causation interpretation
   (therefore: continuum)

but: interpretation towards indirectness: tends to be expressed analytically
    direct causation is more lexical
2.2 Degree of control retained by causee

related to the formal expression of the cause: if causee is inanimate:

(4) John caused the tree to fall → no potential control

if causee is animate: control on a continuum strong ←→ weak

(5) a. I brought it about that John left
   → I persuaded/compelled John to leave

b. I made John leave
   → I imposed on John to leave
continuum grammaticalized via case-marking

Hungarian:      ACC       vs.    INSTR
leaves less control         leaves more control
*I made him go*                  *I asked him to go*
(if he wanted or not)           (he can refuse)
2.3 Valency of morphological causatives

tendency: causative V has valency 1 higher than corresponding non-causative V because it has to accommodate the causer

→ accommodating causer is usually solved by altering the expression of the causee
  - often by emitting, = loss of information, therefore it is not the only way
3. Control hierarchy

most languages: morphological case corresponds with semantic role
ACC: usually for elements with little control
INSTR: usually high degree of control, esp. passive
DAT: typically experiencer/recipient case, has medium position

control hierarchy:  INSTR > DAT > ACC (lowest)

S of $V_{\text{trans}}$: more control than S of $V_{\text{intrans}}$

eamples: (6a.)  counterexamples: (6b.)

(6) a. John fell
   b. John went / John underwent surgery
1. The Concept of implicit causality

1.1 Causative connectors

Causative connectors: e.g. conjunctions – modelling advantage: biclausal causativity
- less conflated cause-effect relationship
→ less ambiguous conceptualization

1.2 Implicit causality
- influence on anaphora resolution = associating anaphor with the coreferenced antecedent
- easy with gender cues but:

causality test: processor uses implicit causality information for focus on antecedent or to facilitate integration
(1) a. John questioned Mary

- cause can be ascribed to *John* (NP₁) or *Mary* (NP₂), but: mainly to ….
(1) a. John questioned Mary

- cause can be ascribed to John (NP₁) or Mary (NP₂), but: mainly to NP₁

(1) b. John questioned Mary because he…

(2) a. John praised Mary

- cause can be ascribed to John (NP₁) or Mary (NP₂), but: mainly to ….
(2) a. John praised Mary
- cause can be ascribed to *John* \((\text{NP}_1)\) or *Mary* \((\text{NP}_2)\), but: mainly to \(\text{NP}_2\)

(2) b. John questioned Mary because she…

1.3 Causality bias

different \(V\) have a specific implicit **causality bias**

\[ \rightarrow \text{bias} \] has effect on **comprehension**
emerges in resolution of **pronominal anaphora**

cf. anaphora resolution
cf. anaphora resolution

(3) a. Mary protects Lisa because she is nice
    b. Mary likes Lisa because she is nice

Question: *Who is she?* (old study by Garvey/Caramazza, 1976)
(3) a. Mary protects Lisa because she is nice
   b. Mary likes Lisa because she is nice

Question: Who is she? (old study by Garvey/Caramazza, 1976)
Findings: 3a. 90% Mary
          3b. 90% Lisa

implicit V causality because only V has changed

→ link between V semantics and conceptualization
1.4 Causality incongruency

incongruent causes in the *because*-clause → longer reaction times

(= causality congruency effect, cf. Caramazza et al.)

→ a constraint that affects sentence comprehension

(4) Darryl interrogated Phil because he wanted the truth

- implicit causality makes reader focus on cause,

thus  \( he = Darryl \)
2. Accounts to explain implicit causality

Two accounts suggested: focusing account (Garnham, McWhinney, cf. example 4.)
integration account,

interpretation only cued when cause in *because*-clause is processed

2.1 Data support

→ NP₁-biasing V: faster recognition of NP₁
→ NP₂ biasing V: faster recognition of NP₂ for immediately & 200ms after equal NP₂/NP₁ for after whole sentence

explanation for faster NP₂ recog.: for NP2-bias V strongly on NP2 or: recency effect congruency effect hints at integration account

connective *because* needed to affect processing of implicit causality info (Ehrlich, 1980)
Tab. 1: Steward et al study (cf. Steward/Pickering/Sanford, 2000)

<table>
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<tr>
<th>anaphor</th>
<th>implicit cause</th>
<th>congruency</th>
<th>example</th>
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<td><em>J congratulated R because she had won</em></td>
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</table>
2.2 Data discussion

difference names/pronouns:
- names: indicate change in situation or to cue re-focus
- pronouns: refer to antecedents that are focussed
  - focussed antecedents facilitate pronoun processing

→ focusing account predicts interaction pronouns/congruence
→ leads to dependency of congruence and anaphor type (pronouns are ambiguous)
→ inhibition with incongruent sentences

causality congruency effect is stronger with reading time
  stronger with repeated name than with pronoun

but: no elimination of congruence effect as predicted by focusing account
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1. Test of coreference via implicit causality

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Test results 08/01/08 for A-E and A-P (rounded), $n=14$
Morphological causatives – productivity test
## Frequencies and mean acceptability scores

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<th>Acceptability judgment score in %; n=44</th>
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<td>Fasten</td>
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<td>Harden</td>
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<tr>
<td>Deepen</td>
<td>655 59 *to sharp vs. to sharpen 41</td>
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<td>Blacken</td>
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<tr>
<td>Sweeten</td>
<td>126 79 *to sick vs. to sicken 21</td>
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<td>Redden</td>
<td>123 82 *to sweet vs. to sweeten 18</td>
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<tr>
<td>Sicken</td>
<td>107 89 *to ripe vs. to ripen 11</td>
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<tr>
<td>Deafen</td>
<td>83 90 *to smart vs. to smarten 10</td>
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<tr>
<td>Smarten</td>
<td>55 92 *to cheap vs. to cheapen 08</td>
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<tr>
<td>Cheapen</td>
<td>40 96 *to loose vs. to loosen 04</td>
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<tr>
<td>Roughen</td>
<td>31 96 *to rough vs. to roughen 04</td>
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</tbody>
</table>
The parameter of productivity

- low scores for *roughen, loosen* and *cheapen*

verbal use is outnumbered by frequent adjectival use of *rough* and *cheap*.

<table>
<thead>
<tr>
<th>A</th>
<th>frequency A</th>
<th>frequency V</th>
<th>V\textsubscript{caus}</th>
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</tbody>
</table>

Frequency relationship adjective: deadjectival $V_{caus}$
Bayesian Modelling

Bayes's theorem: revise a decision on basis of gradual knowledge → re-negotiate probability of category membership.

**Bayes’ theorem**

\[
P(M|x) = \frac{(P(x|M)) (P(M))}{(P(x|M)) (P(M)) + (P(x|M')) (P(M'))}
\]

with:

- \(P(M)\) = mean probability that \(V_{caus}\) is a member
- \(P(M')\) = mean probability that \(V_{caus}\) is not a member
- \((P(x|M'))\) = probability that \(A\) has property \(x\) but is not a member
- \((P(x|M))\) = probability that \(A\) has property \(x\) and is a member

\(P(M|x)\) represents result, learner has confidence that \(V_{caus}\) is a member
Example: it exists with 80% certainty
further information establishes it also has property x
(e.g. +/-inchoative, +/-spontaneous, +/-psych etc.)
→ recalculated probability of category membership

\[ P(\text{belongs to it}) = 0.8 \]
\[ P(\text{does not belong}) = 0.2 \]
\[ P(\text{+inchoa} | \text{belongs}) = 0.6 \]
\[ P(\text{+inchoa} | \text{does not belong}) = 0.3 \]

\[ = 0.6 \times 0.8 / (0.6 \times 0.8) + (0.3 \times 0.2) = 0.88888 \]
2. Cognitive modelling of causation

2.1 The Indeterminacy problem

**Sensory input:** does not contain explicit causal information
→ must be computed from sensory input (in a specific way)

sensory input: presence/absence of candidate cause and of effect
2.2 The covariation principle

**Covariation** between cause and effect: extent to which they vary together

*contingency* \[ \Delta P_i = P(e|i) - P(e|i') \]

- \( i \) = candidate cause, \( e \) = effect
- \( P(e|i) \) = probability of \( e \) given the presence of \( i \)
- \( P(e|i') \) = probability of \( e \) given the absence of \( i \)

→ probabilities estimated by relative frequency of events for which \( e \) happens in the presence (necessary and sufficient conditions) or absence of \( i \)
(1) a. Rain$_i$ causes floods$_e$ \[ \Delta P_i = \text{(estimated)} \]
   b. Lack of rain$_i$ causes drought$_e$ \[ \Delta P_i = \text{(estimated)} \]

2.3 Application to linguistic input

if $\Delta P_i$ is positive: \( i \) is a cause
if $\Delta P_i$ is negative: \( i \) is a preventing cause (= \( e \) happens if \( i \) is not present)
if $\Delta P_i = 0$ : \( i \) is noncausal
(2) a. Quarrel erupted because Michelle came for a visit  
b. Quarrel can erupt because Michelle comes for a visit  
c. Quarrel may erupt because Michelle will come for a visit  
d. Quarrel erupted because Michelle cancelled her a visit  
e. Quarrel did not erupt because Michelle came for a visit  
f. Quarrel may not erupt because Michelle will come for a visit  
g. Quarrel erupted and Michelle came for a visit

Calculate the contingencies according to the linguistic input in (2)

2a. 2b. 2c. 2d.  
2e. 2f. 2g.
(2) a. Quarrel erupted because Michelle came for a visit
   b. Quarrel can erupt because Michelle comes for a visit
   c. Quarrel may erupt because Michelle will come for a visit
   d. Quarrel erupted because Michelle cancelled her a visit
   e. Quarrel did not erupt because Michelle came for a visit
   f. Quarrel may not erupt because Michelle will come for a visit
   g. Quarrel erupted and Michelle came for a visit

Calculate the contingencies according to the linguistic input in (2)

2a. 1-0=1  
2b. 0.5-0=0.5  
2c. 0.3-0=0.3  
2d. 0-1=-1

2e. 0-1=-1  
2f. 0.7-1=-0.3  
2g. 1-0=1
2.4 Ramification and another problem

Problem of covariation modelling: covariation does not always imply causation

→ $\Delta P_i$ is not sufficient

better approach: “power-approach” by Cheng, 1997
- relies on a priori knowledge framework about causal induction

→ possible interpretation: people do not infer that one is a cause of another when they do not perceive a causal mechanism/a causal power

→ A causes B when A has causal “power”/energy over B
→ causes are not followed by effects, causes produce their effects
3. The “Power”- approach

Problem 1: how are causal relations constructed from input and how distinguished from non-causal relations and from non-causal covariation?

- not constrained by world knowledge alone
- interpretation of causal powers: nearly always acquired
Problem 2: if not innate, how can they acquire it?

- if $\Delta P_i = 0$, it can not always concluded that $i$ is noncausal

Example: Whenever Michelle comes for visit, quarrel erupts, $P(e|i) = 1$
but: When John comes instead of Michelle, quarrel erupts too, $P(e|i’) = 1$

$\rightarrow \Delta P_i = 0$, = Michelle is noncausal, which is wrong

Explanation: any visitor causes quarrel

$\rightarrow$ covariation is “manifestation of unobservable causal powers” (Cheng)