Root and Template in the Representation of Verb Meaning

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GOAL: Determine the overall properties of a lexical semantic representation for verbs which can figure in a theory of argument realization.

PROPOSAL: A theory which distinguishes between a root (i.e., "core meaning") and an event structure template and articulates the relation between them is essential.

CASE STUDY: English object alternations

Background: Types of Lexical Semantic Representations

• Unstructured lists of semantic roles (e.g., Fillmore 1968)

PROBLEMS: Unclear criteria for assignment of roles; lack of one-to-one relation between roles and their morphosyntactic realization; atomicity of roles makes stating generalizations difficult; impossible to state generalizations at different grain sizes.

• Dowty's (1991) proto-role entailments

KEY IDEAS:
— Semantic roles are derived from lexical entailments verbs impose on their arguments.
— Lexical entailments are the criteria for role assignment.

ADVANTAGES: Overcomes problems of atomicity and grain-size; entailment "counting" algorithm ensures that no single feature determines access to subjecthood or objecthood.

• Predicate decompositions or now often "event structures"

KEY IDEA: Verb meanings are bipartite: they can be represented using one of a small set of event types defined in terms of primitive predicates together with a "root" representing a verb's idiosyncratic meaning (Grimshaw 1993, Hale & Keyser 2002, Jackendoff 1983, 1990, Mohanan & Mohanan 1999, Pesetsky 1995, Pinker 1989, RH&L 1998).

ADVANTAGES: Identifying a small, delimited set of event types is considered easier than identifying a comparable set of semantic roles.

REASONS FOR POSITING AN EVENT STRUCTURE:
— Defines a "subeventual" analysis: number and type of subevents, number and type of participants in each subevent; temporal relations between the subevents.
— Defines set of possible semantic roles, as well as natural sets of coocurring arguments.
— Distinguishes meaning derived from root and meaning derived from template.
If these all figure in argument realization, then this argues for event structure approach.

Integrating Roots into Event Structures

Adopting event structures requires articulating a substantive theory of the relation between roots, event structure templates, and the realization of arguments.

Preliminaries: More on roots and event structures

- EVENT STRUCTURE: Most important distinction is whether an event structure is complex, consisting of two subevents, or simple, consisting of a single subevent (L&RH 1999).

(1)　a.　Complex event structure:
　　　　　　e.g., [[x ACT$_{<MANNER>}$] CAUSE [BECOME [y $<STATE>$]]]
　　　b.　Simple event structure:
　　　　　　e.g., [x ACT$_{<MANNER>}$]

- ROOT: What is most important is its ontological categorization, chosen from a fixed set of types (e.g., state, result state, thing, stuff, place/container, manner, instrument)

Roots are systematically associated with event structures

Evidence: Denominal verbs demonstrate clear associations between meaning of base noun and meaning of related verbs, as pointed out by Clark & Clark (1979).
Associations probably are not linguistic, but rather reflect general cognitive principles.

(2)　a.　If N names a container, V means 'put something in that container'.
　　　　　　bag, bottle, cage, garage, pen, pocket, stable, ...
　　　b.　If N names a thing/stuff, V means 'put that thing/stuff someplace'/
　　　　　　'provide someplace with that thing/stuff'.
　　　　　　butter, carpet, diaper, garland, harness, saddle, salt, ...
　　　c.　If N names an instrument, V means 'use that instrument for its purpose'.
　　　　　　bicycle, brush, microwave, rake, shovel, spear, staple, ...

Canonical Realization Rules: Specify the basic event structure template(s) associated with a verb on the basis of the ontological type of its root.
　　　　(Languages may vary within certain limits in these rules.)

(3)　a.　instrument → [x ACT$_{<INSTRUMENT>}$]
　　　　　　(e.g., *brush, hammer, saw, shovel, ...*)
　　　b.　manner → [x ACT$_{<MANNER>}$]
　　　　　　(e.g., *jog, run, creak, whistle, ...*)
　　　c.　result (i.e., externally caused) state (Hale & Keyser 2002, L&RH 1995) →
　　　　　　[[x ACT] CAUSE [BECOME [y $<RES\text{-}STATE>$]]]
　　　　　　(e.g., *break, close, crack, open, split, ...*)

Roots are integrated into templates either as arguments or as modifiers of predicates; roots are italicized and in angle brackets; notated via subscripts when modifiers.

Canonical realization rules ensure that the minimal elements of meaning encoded in a root are given linguistic expression (RH&L 1998).

EXAMPLE: Means/manner vs. result verb distinction (L&RH 1991, RH&L 1998)

A large number of semantic verb classes fall into two subclasses:
— Means/manner verbs: specify manner of carrying out an action (e.g., *pound, sweep*)
— Result verbs: specify the result of an action (e.g., *remove, put, cover, empty, clean*)

	Means/Manner	vs.	Result
— Verbs of Removal:	*shovel*	vs.	*empty*
— Verbs of Putting:	*smear*	vs.	*cover*
— Verbs of Combining:	*shake*	vs.	*combine*
— Verbs of Killing:	*stab*	vs.	*kill*

Means/manner verbs often describe actions performed to bring about some conventionally
   associated result (cf. *sweep clean*), even if result not lexically entailed (Talmy 2000).
Result verbs do not specify the manner in which the associated result is achieved, though
   there may be a conventional way of doing this (cf. *clean a floor/sweep a floor clean*).

A root licenses an event structure according to meaning it encodes; hence, association of:
— a means/manner root with a simple event structure;
— a result root with a complex event structure, consisting of causing and result subevents.

The Licensing of Arguments

THE ROOT PARTICIPATES IN DETERMINING NUMBER AND STATUS OF ARGUMENTS

As means/manner verbs, *run* and *pound* should have same event structure template,
   despite having a different number of arguments: one for *run*, two for *pound*.

(4)   a.   Pat ran.
      b.   Leslie pounded the metal.

WHY? Difference must reflect the nature of the associated roots.
Each root must specify the minimum number of participants in associated event:
      e.g., an event of running minimally involves the runner.
      e.g., an event of pounding minimally consists of a pounder and a surface.
         (see also Goldberg 1995; Grimshaw 1993; van Hout 1996)

ROOT PARTICIPANTS AND EVENT STRUCTURE POSITIONS

Most participants associated with roots are paired with event structure positions.
      Subjects of *run* and *pound* realize such event structure positions.
However, not all root participants are paired with event structure positions.
      The object of *pound* exemplifies such a PURE ROOT PARTICIPANT.
      (cf. Van Valin's (1990) multiple-argument activities with one macrorole)

(5)   a.   Pat ran
         [x ACT$_{<RUN>}$]
      b.   Leslie pounded the metal.
         [x ACT$_{<POUND>}$ y̲]

SUMMARY: Two types of NP arguments in the syntax (cf. Grimshaw 1993):
— Those that realize a root participant associated with an event structure position.
— Those that realize a root participant with no place in event structure (underlined).

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This approach assumes that certain one- and two-argument verbs have the same event structure; that is, their roots are associated with the same event structure template.

CONSEQUENCE: Insight into a well-known subject/object asymmetry:
— Subjects are characterizable in terms of a few semantic role types
— Objects of many verbs don't fall into any natural semantic role:
    e.g., *admonish, fight, follow, imagine, praise, select.*
What is the source of this asymmetry?
— Subjects are always structure participants; they realize the argument of an identifiable
    primitive predicate; hence, their semantic roles are constrained.
— Objects may express pure root participants, and, if so, are licensed by a root alone;
    no constraints on the semantic relation between a root and related participants.

The Contribution of Event Structure to Argument Expression

The two types of event structure vary as to number of structure participants:
• Complex event structures (i.e., two subevents): two structure participants,
    one per subevent, realized as subject and object.
• Simple event structures (i.e., one subevent): one structure participant, realized as subject;
    any other arguments are licensed only by root, one of these may be realized as object.

(6)　　a.　　Complex event structure:
　　　　　　　e.g., [[x ACT] CAUSE [BECOME [y $<RES\text{-}STATE>$]]]
　　　　b.　　Simple event structure:
　　　　　　　e.g., [x ACT$_{<MANNER>}$ ($\underline{y}$)]

CONSEQUENCE: The nonactor argument does not always have the same status.
• When a complex event verb has a root associated with two participants,
    its nonactor argument realizes a structure participant.
• When a simple event verb has a root associated with two participants,
    its nonactor argument realizes a pure root participant.
(The actor argument of both is associated with a structure participant.)

AN EXAMPLE: Surface contact and change of state verbs (RH&L 1998)

These two classes of transitive verbs have roots associated with two participants, but due
to their different event structures, they contrast as to nature of their second argument:
　　　　— Lexically simple change of state verbs (*break, dry, open, ...*) → complex events
　　　　　　Nonactor argument is a structure participant.
　　　　— Surface contact verbs (*wipe, rub, scrub, sweep, ...*) → simple events
　　　　　　Nonactor argument is a pure root participant.

VERB BEHAVIOR REFLECTS EVENT COMPLEXITY

A principle governing the event structure-to-syntax mapping:

THE ARGUMENT-PER-SUBEVENT CONDITION (L&RH 1999)
There must be at least one argument XP in the syntax per subevent in the event structure.
(Grimshaw & Vikner 1993; van Hout 1996; Kaufmann & Wunderlich 1998; RH&L 1998)

- Since a surface contact verb has a simple event structure and, hence, only one subevent,
    only one argument, the actor, is required by the Argument-Per-Subevent Condition,
    though its root is associated with two arguments.
The other argument, a pure root participant, does not fall under this condition.

CONSEQUENCES: When left unexpressed, get unspecified object interpretation;
    other than "normal" objects fine; no reason for object to have consistent semantics.

- Since a change of state verb has a complex event structure with two subevents,
    it must have two arguments by the Argument-Per-Subevent Condition.
Its object must realize the structure participant of the second subevent.

CONSEQUENCES: No unspecified objects; choice and interpretation of object is fixed:
    get uniform semantics (patient), determined by its event structure position.

Surface contact verbs show more argument expression options than change of state verbs:
(RH&L 1998, Wright & Levin 2000; notwithstanding questions raised by Goldberg 2001)
— They allow unspecified objects without recourse to generic or repetitive contexts,
    change of state verbs don't.
— They take nonsubcategorized objects, change of state verbs don't.

(7)   Unspecified Objects:

    a.   Leslie swept/scrubbed (the floor) this morning.

    b.   * Kelly broke again tonight when she did the dishes.

(8)   Nonsubcategorized Objects:

    a.   The child rubbed the tiredness out of his eyes.
       Cinderella scrubbed her hands raw.

    b.   * The clumsy child broke the beauty out of the vase.
       * The clumsy child broke his knuckles raw.

Contribution of Roots and Event Structure Templates to Object Alternations

Descriptively, English object alternations are argument alternations where an apparently
triadic verb maintains the same association of an argument with subject, but can express
either of its other two arguments as its object, with the third usually expressed as an oblique.

GOAL: To determine the contribution of the root and event structure to alternations.

THE PROPOSAL:
Having roots basically associated with simple event structures makes alternations possible;
    that is, "genuine" object alternations have a single source.
The nature of the verb roots themselves determines attested alternations.

(9)   Locative Alternation — 'putting' subtype:

    a.   Jack sprayed paint on the wall.

    b.   Jack sprayed the wall with paint.

(10) Locative Alternation — 'removing' subtype:

    a.   Jack wiped crumbs off the counter.

    b.   Jack wiped the counter.

(11) Material/Product Alternation:

    a.   Martha carved a toy out of the piece of wood.

    b.   Martha carved the piece of wood into a toy.

(12) Image Impression Alternation:

    a.   Taylor embroidered peonies on the jacket.

    b.   Taylor embroidered the jacket with peonies.

(13) *With/Against* Alternation:

    a.   Sam hit the fence with a stick.

    b.   Sam hit a stick against the fence.

(14) Body-Part Possessor Ascension:

    a.   Terry slapped my back.

    b.   Terry slapped me on the back.

CAVEAT: Assume following L&RH (2002) that the dative alternation is not an object alternation in that the first object in the double object construction is not a true "object" (Baker 1997, Hudson 1992, Maling 2001, Marantz 1993).

OBJECT ALTERNATION VERBS BASICALLY HAVE A SIMPLE EVENT STRUCTURE

PREDICTION: Verbs must basically have a simple event structure to show such alternations.
    That is, object alternations reflect event complexity, or, rather, "simplicity".
WHY? Such verbs have only a single structure participant, realized as the subject;
    thus, they have flexibility as to object choice.

HOW WOULD OBJECT ALTERNATIONS ARISE?
An object alternation should be possible if there are two nonactor "arguments" associated with a simple event verb and there are two distinct ways of expressing both simultaneously.

• Semantically, verbs known to alternate are basically means/manner verbs (e.g., they don't entail a result); that is, they have simple event structures.

(15) a.   Locative Alternation (adding): dab, smear, splash, spray, sprinkle, stuff, ...

    b.   Locative Alternation (removing): rake, rub, scrub, shovel, sweep, wipe, ...
        (these are a subset of the surface contact verbs)

    c.   Image Impression Alternation: emboss, embroider, engrave, paint, stamp, ...

    d.   Material/Product Alternation: carve, knit, sculpt, sew, weave, whittle, ...

    e.   *with/against* Alternation: beat, hit, pound, tap, whack, ...

• Object alternation verbs show key properties of simple event verbs:
    they allow unspecified and nonsubcategorized objects.

(16)   Shelly swept/scratched/hit/carved/sewed/knit.

(17)   a.   Cinderella swept and scrubbed her way to a new ball gown.
                Cinderella swept and scrubbed herself into catatonia.

         b.   Drew sewed her fingers sore.
                Drew sewed her way to a job in the fashion industry.

• Denominal verbs named after instruments show object alternations,
      but not those named after things/stuff or containers.
      Only the former, as means/manner verbs, have simple event structures (cf. (3)).

(18)   a.   Tracy shoveled snow off the sidewalk.
                Tracy shoveled the sidewalk.

         b.   Robin brushed oil on the bread.
                Robin brushed the bread with oil.

(19)   a.   Devon saddled the horse with a Western saddle.
                *Devon saddled a Western saddle on the horse.

         b.   Lindsay buttered the toast with unsalted butter.
                *Lindsay buttered unsalted butter on the toast.

• Verbs from certain semantic classes don't show object alternations:
      Change of state verbs (e.g., *break, crack, dim, widen*) don't, nor do verbs of putting
      (e.g., *insert, put*), taking (e.g., *take, obtain*), or filling (e.g., *cover, fill*).

(20)   a.   Lee broke the fence with the stick.
                Lee broke the stick against the fence. (CAN'T MEAN: 'Lee broke the fence')

         b.   Corey shortened the dress.
                *Corey shortened an inch off the dress

         c.   Shannon put/*filled the groceries into the bag.
                Shannon filled/*put the bag with the groceries.

         d.   Shawn obtained the rare metal from Transylvania.
                *Shawn obtained Transylvania of the rare metal.

These are complex event verbs: they specify result states and lack unspecified and
      nonsubcategorized objects.

(21)   *Kelly broke/dimmed/filled/covered/obtained/inserted.

(22)   a.   *My kids broke me into the poorhouse.
                *The puppy broke his way out of the china shop.

         b.   *The stagehand dimmed the scene dark.
                *The stagehand dimmed his way off the set.

         c.   *The waiter filled the table wet.
                *The waiter filled his way to a maitre d' position.

         d.   *Sam inserted the door open.
                *Sam inserted his way to the jackpot.

As complex event verbs, these verbs have two structure participants.
Their objects have their source in a specific event structure position, so no alternations.

• Verbs with stative roots associated with three arguments also show object alternations; again, these are verbs with simple event structures.

(23)   Tony admired them for their integrity.
        Tony admired the integrity in them.
        Tony admired them.
        Tony admired their integrity.

• Material/product alternation verbs don't present a problem for the analysis.

Event complexity is sometimes defined aspectually, as telicity or accomplishmenthood.
        If so, some object alternation verbs would have complex event structures,
        e.g., material/product alternation verbs, such as *carve, knit,* or *sew.*

— If such verbs had complex event structures, they should pattern like change of state verbs
        with respect to critical properties, e.g., unspecified and nonsubcategorized objects.
But they actually pattern like surface contact verbs, which have a simple event structure.

(24)   a.   Cameron carved/knit/sewed.
        b.   ... she could, and did, KNIT her way serenely through all the complications
                which murder produces ... (P. Wentworth, *Pilgrim's Rest,* 1946; Harper-
                Perennial, New York, 1993, p. 12)

— L&RH (1999, to appear) argue aspectual definitions of "complex event" are not relevant
        to the Argument-Per-Subevent Condition.
THEIR ALTERNATIVE: An event whose subevents aren't necessarily temporally dependent.
EVIDENCE: Change of state verbs (i.e., lexical causatives) and resultatives.

By this definition, an event of carving a cat out of a chunk of wood is not complex,
        even if it were said to have two subevents: an event of using a knife on the wood
            and an event of a cat shape emerging.
WHY? These subevents are necessarily temporally dependent.

THE LICENSING OF ALTERNATE OBJECT CHOICES

Having a simple event structure is necessary, but not sufficient, for object alternations;
        e.g., *push* and *drink* do not show object alternations, though simple event verbs.
Showing object alternations requires that alternate object choices be licensed.

A SKETCH (actual details of how licensing works need further investigation):
There are two interacting sources of licensing:
— Roots that are inherently associated with two or three participants
— Nonverbal predicates that allow a verb's simple event structure to be augmented
        to a complex event structure, while also licensing structure participants.

TEMPLATE AUGMENTATION (RH&L 1998):
        Event structure templates may be freely augmented up to other possible templates.

Simple event verbs are candidates for template augmentation,
        since it yields a possible event structure: a complex event structure.

AN EXAMPLE: The removing form of the locative alternation.

Assume *wipe* describes a process; its root is basically associated with an actor and a surface.
wipe does not entail a particular result (Talmy 2000), though wiping is a means of
       removing stuff from a surface;
wipe's event structure can be augmented via the addition of a predicate to give a
       complex removing event, with an added predicate licensing the stuff argument, and
       the "normal" (location) object appearing in a newly introduced result clause.

(25)   a.   Kelly wiped the table.
               $[\, \text{x ACT}_{<WIPE>} \; \underline{y} \,]$
        b.   Kelly wiped the crumbs off the table.
               $[\, [\, \text{x ACT}_{<WIPE>} \; \underline{y} \,] \; \text{CAUSE} \; [\, \text{BECOME} \; [\, \text{z NOT AT} \; <PLACE> \,]\,]\,]$

Some verbs may have roots which are basically associated with three participants:
       for example, the locative alternation verb *smear*: actor, stuff, surface.
Either the stuff or surface can be expressed as object: *smear the jam* or *smear the bread*.
Locative alternation arises when all three arguments are expressed, as there are two
       appropriate predicates to license a third argument: *with* and a spatial PP.

(Patterns of optionality and obligatoriness of arguments reflect the fine semantics of the
roots; thus, *smear*'s root says something about the nature of the stuff and how it is applied,
but not about the surface.)

The Diversity of English Object Alternations

• If object alternations have a unified source, why is there diversity in the alternations
       and the semantic classes of verbs showing them?

The variants in the alternations typically denote complex events, consisting of
       a causing subevent—containing the verb's root—and a result subevent;
       the result is typically a conventional result of the causing subevent (Talmy 2000).
Result subevents come in various types: removal, addition, creation, . . .
       The various types of object alternations reflect different types of results.
          Locative alternation: Addition or removal
          Material/product and image impression alternations: Creation

Each type of result subevent is brought about by particular (conventional) activities.
Concomitantly, there are associated classes of means/manner verbs,
       describing modes of removing, adding, creating, . . .

• Why do some simple event verbs show more object alternations than others?

(26)   a.   Kelly sewed bows on the costume.
               Kelly sewed the costume with bows.
        b.   Kelly sewed the lining to the skirt.
               Kelly sewed the lining and skirt together.
        c.   Kelly sewed the piece of silk into a ball gown.
               Kelly sewed a ball gown out of the piece of silk.

(27)   a.   Alex scratched the tree.
               Alex scratched her name on the tree.

       b.   Alex scratched her name off the tree
               Alex scratched the tree.

(28)   a.   Kim pushed the cart into/against/out of the store.
             * Kim pushed the store with/of the cart.

       b.   Kim pushed her way to the front of the line.

Although object alternation verbs have simple event structures, in the alternations
      they are found in complex event structures, built on these simple event structures,
      each characterized by a particular type of result.
Thus, only verbs with roots describing means/manners that can be used to obtaining
      various types of results can show multiple alternations.
EXAMPLE: *sew* has such a root, since sewing can be used to create an object,
      "impress" an image, cover a surface, or attach things.

A verb whose root describes a means/manner used only to obtain a very specific result,
      such as *vacuum*, will not show a range of object alternations.
A verb whose root describes a means/manner which is not used to obtain a particular result,
      such as *drink*, will not show object alternations.

• Why do stative verbs show few object alternations?

Many object alternations arise from conventional associations between means/manner verbs
and particular results, with a result predicate playing a key role in argument licensing.

Stative verbs, by their very nature, are not conventionally associated with particular results;
      thus, a result predicate is not available to license any arguments.
To show object alternations their roots must be associated with three participants and
      there must be some other way of licensing the expression of all three simultaneously.
      Yet, few stative verbs have sufficient root participants.
In the attested object alternation, the stative verb has two root participants and
      a third participant is introduced as the possessor of one of the root participants.

Conclusions

• The account of English object alternations is predicated on:
      — The root/event structure distinction
      — The existence of event structures with a subeventual analysis

• English object alternations are epiphenomena of the interaction of certain types of roots,
simple event structures, and principles of argument licensing.

• Object alternations have a more unified analysis than their semantic variety suggests:
they arise because simple event verbs do not restrict their potential objects.

• The semantic heterogeneity of object alternations reflects natural correlations between
certain means/manners and certain types of results; the semantic range of verbs showing a
particular alternation reflects the range of means/manners for achieving each result type.

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