Resultatives and the Semantics of Verbal Roots*

Ryan Walter Smith, Jianrong Yu
University of Manchester, KU Leuven
ryan.smith-3@manchester.ac.uk, jianrong.yu@kuleuven.be

LAGB 2022, September 12-15
Ulster University, Belfast UK

1 Introduction

- Resultatives are, descriptively speaking, constructions consisting of a verb describing the *manner* in which a *result state* comes to hold, i.e., a decompositional structure and semantics paraphrasable as VERB CAUSE X BE YP.

- The object of the resultative may be *selected*, in which case it is naturally interpreted as the theme of the manner event, or *unselected*, in which it bears no relation to the manner event.

  (1) Mary hammered the metal flat. (*selected object*)

  (2) Jeremy ran the shoes ragged. (*unselected object*)

- We propose a compositional syntax and semantics for such constructions based on the following tenets:

  1. The root of the manner verb denotes a function from relations between individuals and events to a relation between individuals and events (Smith and Yu 2021; Zhang 2022).
  2. The result component of a resultative is an argument of the verb root.
  3. There is no syntactic or semantic distinction between selected and unselected resultatives.
  4. The object of a resultative, whether selected or unselected, is generated in the same position as direct objects more generally.

- We show that the analysis makes correct predictions about the interaction of resultatives with depictive secondary predication (Bruening 2018), agentless presuppositions (Bale 2007; Smith and Yu 2021), and adverbial modification of the manner event.

- We compare our analysis with previous small clause analyses (Kayne 1984; Hoekstra 1988; Kratzer 2005; Harley 2005, a.o.) and complex predicate analyses (Dowty 1979; Rothstein 2004; Williams 2015, a.o.), demonstrating that these previous approaches make incorrect predictions with respect to the phenomena noted above.

*We thank Andrew Koontz-Garboden and Jens Hopperdietzel for their questions and comments on the material presented here.

2 Background

- Smith and Yu (2021) propose an approach to the semantics of verb roots, on which such roots denote functions from thematic role functions of type $<e,vt>$ to functions of type $<e,vt>$.
- On this approach, roots compose with a syntactically projected thematic role, followed by an individual, the result of which is an event predicate (3).

  (3) $[\![\sqrt{\text{ROOT}}]\!] = \lambda\theta_{e,vt}.\lambda x.\lambda e.\text{ROOT}(e) \wedge \theta(x)(e)$

- The primary motivation for such an analysis comes from observations about the availability of *agentless presuppositions* with the presupposition trigger *again*, originally observed by Bale (2007): agentless presuppositions are possible with eventive transitive verbs, but not with intransitive verbs.

  (4) CONTEXT: Seymour's dryer broke. He called **a repairwoman who simply hit the dryer until it started working**. The dryer broke down two days later. So...
  Seymour hit the dryer again.

  (5) CONTEXT: Last week, Jon's wife ran all morning. Then after she got home, Jon was able to do some exercise. So...
  # Jon ran again.

- While Bale treated this as a lexicalized difference between verb classes, the same effect can be observed with optionally transitive verbs: the transitive, but not the intransitive, variant permits agentless presuppositions.

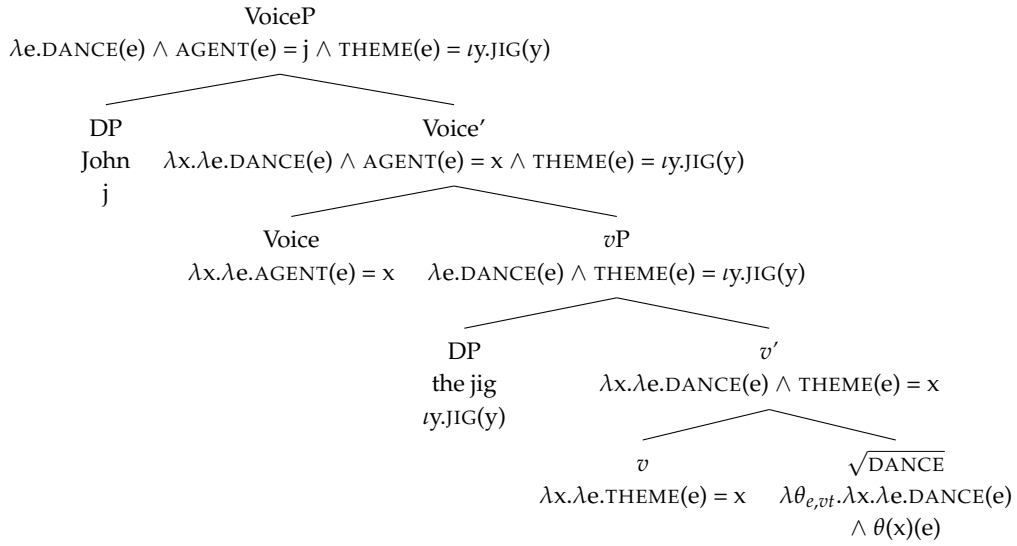
  (6) At a ball in honor of the king, John danced the Irish jig. The king was so impressed that he had his court dancer James learn this dance, and. . .
  a. **# James danced again.**
  b. **James danced the Irish jig again.**

- Smith and Yu (2021) resolve this issue by treating eventive verb roots as uniformly of the type in (3). The availability of an agentless presupposition with *again* then turns on whether a thematic role is introduced vP internally or not. In the transitive case, v introduces the THEME thematic role, with a denotation as in (7), along with a DP in its specifier to fill that role.

  (7) $[\![v]\!] = \lambda x.\lambda e.\text{THEME}(e) = x$

- The thematic role introduced by v and the individual-denoting DP saturate the thematic role and individual argument of the root, respectively. The AGENT role is introduced in VOICE, as in Kratzer (1996), with the agent argument introduced in the specifier of VOICEP.
- VOICE composes with vP by Kratzer's rule of EVENT IDENTIFICATION, and the individual argument of the output of this rule is saturated by the individual-denoting DP in the specifier of VOICEP. This is summarized in the derivation in (8) below.

(8) John danced the jig.



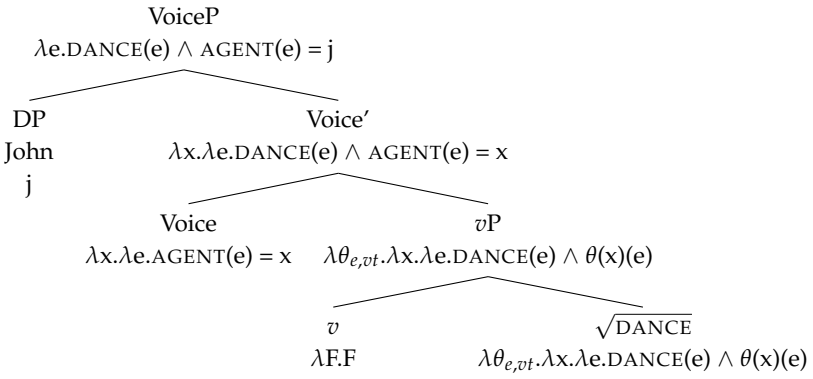
- In combination with a suitable definition of *again*, as in (9) below (adapted from Bale 2007), agentless presuppositions are correctly predicted to only be available in (8), because the *v*P is of the right type to be *again*'s first argument.

  (9) $[\![\textit{again}]\!]$P(e) is defined iff $\exists e^1 \exists e^2 [e^1 \prec e^2 \prec e \;\&\; P(e^1) \;\&\; \neg P(e^2)]$.
  When defined, $[\![\textit{again}]\!]$P(e) = P(e). $<<vt>,<v,t>>$

- In the intransitive case, on the other hand, *v* introduces no thematic role, and instead denotes an identity function on root denotations, effectively passing the root's meaning up to the *v*P-level.

- It is then the AGENT role introduced in VOICE that saturates the the root's thematic role argument, with the DP in spec,VOICEP saturating the individual argument. An example derivation of an intransitive sentence up to VOICEP is provided in (10).

  (10) John danced.



- Here the only node of the right type to serve as *again*'s argument is VoiceP, therefore ruling out agentless presuppositions with *again*.

3 Extension to resultatives

- Though designed with composition with a thematic role in mind, Smith & Yu's analysis does not limit verbal roots to composing specifically with thematic role functions.

- As long as the root's argument is of the right type (<*e,vt*>), there are no strong restrictions on the kind of object the root can compose with.
- We therefore expect verbal roots to compose with expressions other than thematic role functions introduced in *v*.
- What's more, Smith & Yu's analysis of verbal roots can be seen more specifically as a theory of the roots of *manner verbs* in the sense of Rappaport-Hovav and Levin (1998, 2010).
  - These are verbs of *non-scalar* (i.e., non-measurable) change that specify types of actions, Canonical examples include *blink*, *jog*, *run*, *scrub*, *sweep*, etc. (Rappaport-Hovav and Levin, 1998, 2010).
- Given these facts about the analysis, we extend Smith & Yu's approach to an analysis of the resultative construction.
  - The verbal root provides the *manner* component of the resultative.
  - The *result phrase* acts as the first argument of the verb root *qua* relation between individual and event, like a thematic role function.
- We build up the analysis on the basis of the selected object resultative in (11).

  (11) Martha hammered the metal flat.

- At the core of the result phrase is a stative constituent, typically an AP or PP; we analyze these as functions from individuals to predicates of states, as in (12).

  (12) $[\![\textit{flat}]\!] = \lambda x.\lambda s.\textsc{flat}(x)(s)$

- This stative constituent composes with an eventive head RES(ULT), which introduces a causative relation between an event and a state (13).

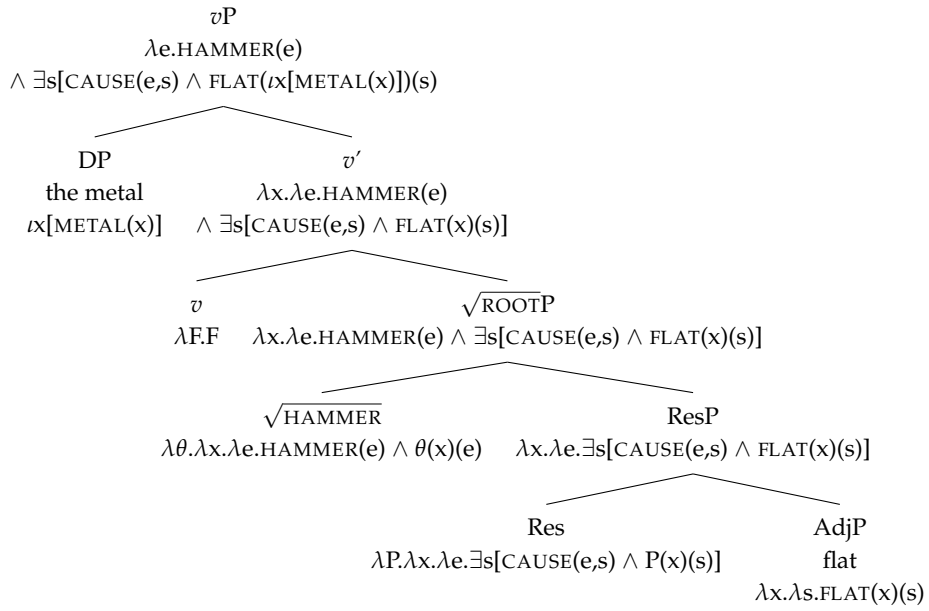
  (13) $[\![\textsc{Res}]\!] = \lambda P.\lambda x.\lambda e.\exists s[\textsc{cause}(e,s) \wedge P(x)(s)]$

- Composition of Res with a stative constituent yields a function of type <*e,vt*>, exactly the type of the first argument of a verbal root on Smith & Yu's analysis. We propose, then, that the verbal root takes the RESP as its first argument (14).

  (14) a. $[\![\sqrt{\textsc{Hammer}}]\!] = \lambda\theta_{e,vt}.\lambda x.\lambda e.\textsc{hammer}(e) \wedge \theta(x)(e)$
  b. $[\![\sqrt{\textsc{Hammer}}\ \textsc{ResP}]\!] = \lambda x.\lambda e.\textsc{hammer}(e) \wedge \exists s[\textsc{cause}(e,s) \wedge \textsc{flat}(x)(s)]$

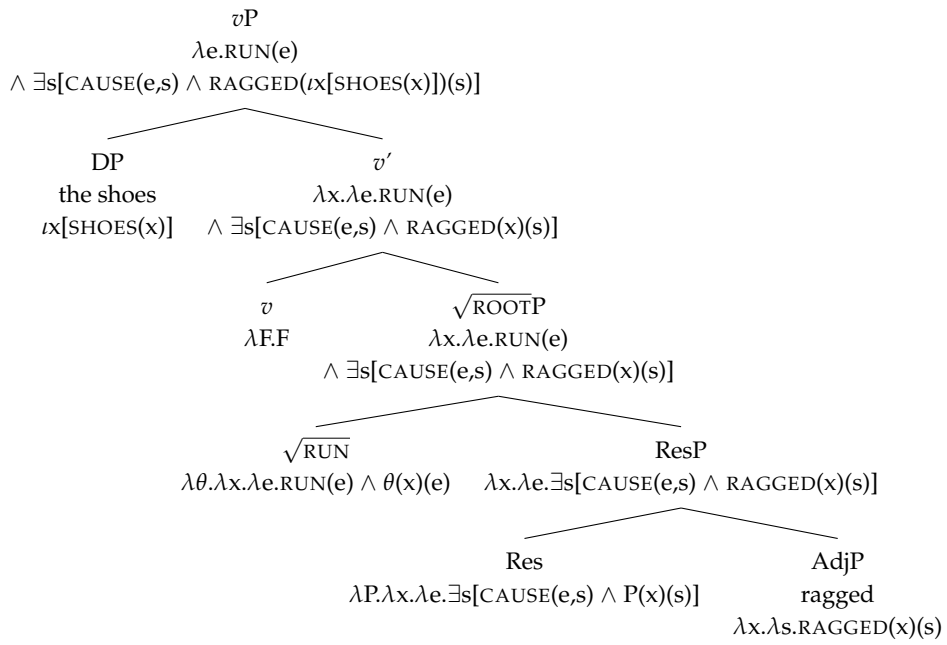
- The object is introduced in the specifier of *v*P, with *v* itself denoting an identity function on <*e,vt*>-type functions. The DP in the specifier of *v*P then saturates the individual argument, yielding an event predicate. The analysis is summarized in (15).

(15) Martha <u>hammered the metal flat</u>.



- Our analysis handles unselected object resultatives in exactly the same fashion, as can be seen in (16). We therefore make no syntactic or semantic distinction between selected and unselected object resultatives (e.g., Hoekstra 1988; Kratzer 2005).

(16) Martha <u>ran the shoes ragged</u>.



- The resulting analysis amounts to a hybrid approach, consisting of an *outside object syntax* (Williams, 2015) with a *result patient semantics* like that of Kratzer (2005).
- This leads to correct predictions in a number of domains where other approaches fall short, as we now discuss.

4 Predictions

4.1 Depictive secondary predication

- A crucial piece of evidence that favors our analysis comes from the interaction of resultatives with *depictive secondary predication*.
- Depictives describe a state that an individual holds during an event. In (17), for instance, the metal is understood to be wet during the carrying event (Bruening, 2018).

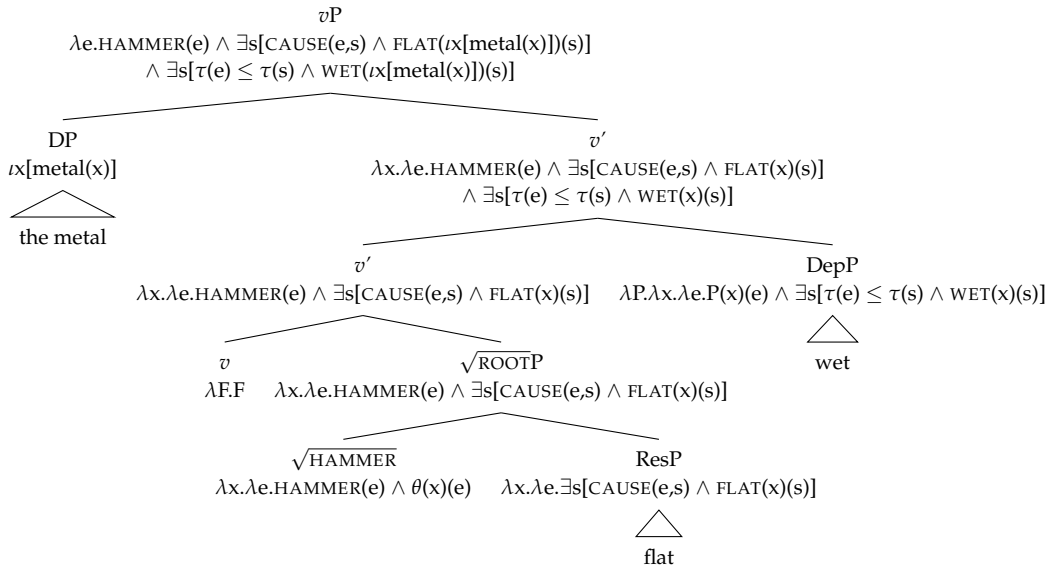
  (17) She carried the metal wet

- For the sake of concreteness, we adopt an analysis of depictives as in (18).
- In words, the depictive head requires that an event's *runtime* (or *temporal trace*) τ(e) be included in the runtime of a state τ(s). $\leq$ denotes the inclusion relation among temporal intervals, which is introduced by a dedicated functional head DEP(ICTIVE) (see also e.g., Pylkkänen 2008).

  (18) $[\![\text{DEP } \textit{wet}]\!] = \lambda P_{e,vt}.\lambda x.\lambda e.P(x)(e) \wedge \exists s[\tau(e) \leq \tau(s) \wedge \text{WET}(x)(s)]$

- On our analysis, the object of the resultative is introduced in the specifier of vP, and composes with a function from individuals to event predicates.
- This predicts that depictives should be able to characterize a property of the object that holds *over the course of the causing event, but not one that only holds over the course of the result state*, regardless of whether the resultative involves a selected or unselected object.

  (19) Martha <u>hammered the metal flat wet</u>.



- This prediction is borne out: as Bruening (2018) demonstrates, depictive modifiers only pick out the state of the object during the causing event, and never exclusively during the result state, as the infelicity of the (b) examples in (20-21) shows.
- This is true regardless of whether the object of the the resultative in question is selected (20) or unselected (21).

(20) a. It's best to hammer metal flat wet, but it's OK if it has dried by the time it's completely flat.

b. # It's best to hammer metal flat dry, but it's OK if it's wet during the hammering. (Bruening, 2018, p. 540, ex. 6)

(21) a. That marathoner ran his shoes ragged untied, although he finally tied them once they started falling apart.

b. # Once that marathoner's shoes started falling apart he untied them, so he ran his shoes ragged untied. (Bruening, 2018, p. 541, ex. 9)

4.2 Agentless presuppositions

- Our analysis predicts that agentless presuppositions with *again* of the kind discussed by Bale (2007) and Smith and Yu (2021) should be available with resultatives, regardless of the selected or unselected nature of the object.
- This follows from the fact that the type of the *v*P, which does not include the agent argument, is $<v,t>$, and is therefore of the appropriate type to serve as an argument of *again*.
- To test this, we need to control for the independently available *restitutive* reading of *again*, which merely presupposes the existence of a previous state of the same type as the result state independently of any causing event.
- This can be accomplished by placing *again* to the left of the VP, rather than to the right, which eliminates the restitutive reading while leaving the repetitive reading intact (Beck and Johnson, 2004; Bale, 2007).
- We observe that agentless repetitive presupposition with *again* is felicitous, while contexts satisfying a restitutive presupposition are not.

(22) CONTEXT: Mary kicked the door open. The wind blew, closing the door, so John got up and...
John again kicked the door open. (agentless presupposition)

(23) CONTEXT: A door was built open, and thus has never been closed. The wind blew, and closed the door for the first time. John came up and kicked the door, causing it to regain its open state.
So **#John again kicked the door open**. (cf. John kicked the door open again)

- We see that unselected resultatives permit agentless presuppositions as well, even when the restitutive reading of *again* is ruled out, as predicted by our analysis.

(24) CONTEXT: Jimbob's son Billy was having trouble getting to sleep, so he sang a lullaby to him until he fell asleep. Unfortunately, Billy woke up after only a short time, so Jimbob called his neighbor Juan, renowned for his soothing voice, and Juan's singing quickly lulled Billy into a profound slumber.
So **Juan again sang Billy asleep**.

(25) CONTEXT: Billy was sleeping soundly, but was woken up by a thunderstorm. His father Jimbob came in and sang him a lullaby so he could go back to sleep.
#Jimbob again sang Billy asleep (cf. Jimbob sang Billy asleep again)

4.3 Modification of the manner component of the resultative

- Our analysis, like any analysis that equates the manner contributed by the verb and the causing event, predicts that the causing event can be modified independently of the result state of the resultative or the change into that state.
- This prediction is borne out: in (26), *loudly* can only be understood to modify the singing event, and cannot be understood to modify the baby's being asleep nor their transition into a sleeping state.
- Likewise, *daintily* in (27) can only describe the pressing event, not the paper's resulting flatness or change into a flat state.

(26) Al loudly sang the baby asleep

(27) Jim daintily pressed the paper flat

- This point is worth elaborating on, as previous authors have argued that such modification of the manner event is impossible, on the basis of examples like (28) (Rappaport Hovav and Levin 2001, Williams 2007, Williams 2015).

(28) Al slowly pounded the cutlet flat. (Williams 2007, p. 4, ex. 12)

- (28) is true in a situation in which the cutlet undergoes a slow change into a flat state.
- Crucially, such a sentence can be true even if the *means* by which the flattening is achieved e.g., pounding in (28), is done quickly. In other words, (28) does not entail (29).

(29) Al slowly pounded the cutlet.

- At first blush, this appears to be a problem for our analysis: the means and causing events are equated, so we do seem to predict that (28) entails (29).
- However, it turns out that sentences like (28) are confounded by an independent property of adverbs of space and time like *slowly* and *quickly*: they are ambiguous between a *ratio reading* and an *extent reading* (Cresswell, 1977; Rawlins, 2013, *a.m.o*).

(30) Alfonso ran to the park quickly.
   a. *Ratio reading*: Alfonso ran to the park in a quick manner.
   b. *Extent reading*: Alfonso ran to the park in a short time.

(Rawlins, 2013, p. 154, ex. 2)

- While both readings are available in (30), in many contexts only one reading is available, with the available reading depending on the *Aktionsart* of the VP.
- Accomplishments like (31a) typically only have the extent reading, while activity predicates like (31b) only have the ratio reading.

(31) a. Alfonso won the race quickly. (extent/*ratio) (Rawlins, 2013, p. 155, ex. 3)
   b. Alfonso ran quickly. (ratio/*extent) (Rawlins, 2013, p. 155, ex. 5)

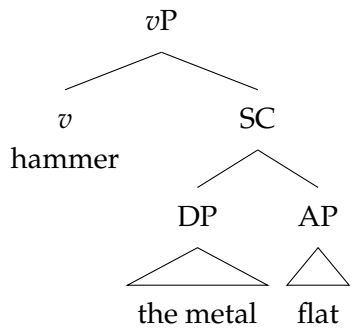
- The evidence from adverbs of space and time thus receives an independent explanation: the resultative in (28) patterns like the accomplishment in (31a) in only admitting the extent reading, while the same sentence lacking the result phrase in (29) is an activity predicate, and thus only permits the ratio reading.

5 Previous analyses

5.1 Small-clause analyses

- On small clause analyses of resultatives, the apparent object of a resultative is analyzed as the subject of the small clause containing the AP or PP result state component, along the lines of the tree shown in (32) (Kayne, 1984; Hoekstra, 1988; Kratzer, 2005).

(32)



- On such analyses, the resultative object bears no syntactic or semantic relation to *v*P.
- Because of this, as Bruening (2018) notes, depictives should never be able to pick out a state of the individual denoted by the DP during the runtime of the hammering event introduced at the *v*P level.
- Rather, at best, the prediction is that the state introduced by a depictive should have to hold during the runtime of the *result state* that holds after the event.
- In other words, small clause analyses make the opposite prediction of our own analysis: small clause treatments incorrectly predict that the (a) sentences of (20-21) should be felicitous, rather than the (b) sentences, contrary to fact.
- Crucially, Bruening (2018) shows that true small clauses *do* allow for depictive modification (33); these facts are therefore not due to depictives being incompatible with small clauses in general.

(33) a. I want [the soldiers on the parade ground fully dressed]
b. I consider [him beneath contempt drunk] (Bruening, 2018, p. 549, ex. 32a, d)

- Small clause approaches to resultatives therefore cannot appeal to any ban on the modification of small clauses by depictives.
- By contrast, on our analysis, resultatives do not contain a small clause component, and therefore the state denoted by the depictive is predicted never to hold only during the runtime of the result state, the right prediction.

5.2 Complex predicate analyses

- An alternative to small clause analyses treats resultatives as *complex predicates*.
- On such approaches, the meanings of the manner verb and the result component are combined in some way, and then compose with the meaning of the direct object (Dowty 1979, Rothstein 2004, Williams 2007, Williams 2015).
- Our own approach falls into the complex predicate family, with clear precedents in Dowty (1979), though motivated on the basis of different principles and phenomena.
- This said, our analysis differs from previous complex predicate analyses in important ways.
- First, while our analysis makes crucial use only of FUNCTION APPLICATION, complex predicate analyses typically require additional compositional and interpretative mechanisms beyond FUNCTION APPLICATION to successfully analyze resultatives:
  - Dowty (1979) requires two additional composition rules, one for selected and the other for unselected resultatives.
  - Rothstein's analysis invokes a rule of RSUM, particular to resultatives, to derive the sum of the manner and result eventualities standing in the desired culmination relationship, in addition to a type-shifter for unselected resultatives.
  - The outside role analysis of Williams requires meaning postulates to link the causing, means, and result eventualities to one another, such that, for example, the PATIENT of e_c is understood to be the holder of e_r.
- Second, due to the common assumption among these authors that verbs denote functions from all of their arguments, previous complex predicate analyses have no way of explaining the availability of agentless presuppositions with *again* with resultatives, a phenomenon our own analysis immediately explains.
- A third point concerns the relationship between the manner event and the result state, and the modifiability of the former independently of the latter.
- On the *outside role analysis* of Williams (2015), for example, a resultative contributes an *event of causation* e_c, which is to be understood as an *event of change* "in which some individual y changes, entering a state e_r of a type defined by (a result predicate) R" (Williams 2007, Williams 2015).
- This event of causation is distinct from the manner or means event e_m contributed by the manner verb, as well as from the result state e_r contributed by the result phrase.
- The subject and object then stand in thematic relations to this event of causation, and are related to the overt means and result predicates by a relation K.
  - The outside role analysis is therefore *trieventive*, rather than bieventive like our own and small clause analyses, as can be seen in (34).

(34) Outside role analysis for *Al pounded the cutlet flat* (adapted from Williams (2007), ex. 11a):
$\exists e_c \exists e_m \exists e_r [K(e_c e_m e_r) \wedge \textsc{pound}(e_m) \wedge \textsc{flat}(e_r) \wedge \textsc{Agent}(e_c)(al) \wedge \textsc{Patient}(e_c)(\textit{the cutlet})]$

- On Williams' analysis, the means event cannot be modified: only the event of causation can.

- Williams argues that this is a correct prediction of his analysis.
  - However, his supporting evidence comes from adverbs of space and time like *quickly* and *slowly*, which were shown in (31) above to be subject to a confound due to the independent difference between accomplishment and activity predicates.
  - Furthermore, our examples in (26) and (27) showed that the manner event *can* be modified.
- These issues lead us to conclude that the outside role analysis makes incorrect predictions about the modifiability of the means event, unlike our analysis.

6 Conclusion and future research

- We have developed an analysis of resultatives building on the semantics of verbal roots proposed in Smith and Yu (2021).
- We showed that the analysis makes correct predictions about the interaction of resultatives with other constructions, and that it improves on earlier small clause and complex predicate analyses.
- Ongoing and future work will aim to address the following research areas:
  1. Extension of the analysis to resultative constructions in other languages.
     - How do languages differ in the range of possible resultatives available to them, and does this analysis shed light on those differences?
     - More specifically, our analysis can be seen as an approach to *strong* resultatives in the sense of Washio (1997). How do strong resultatives differ from *weak* resultatives in other languages, on our style of analysis?
  2. Further exploration of the analysis of verbal roots in independent directions, such as the analysis of the conative alternation (cf. *John kicked/swept at the floor*).

References

Bale, A. (2007). Quantifiers and verb phrases: An exploration of propositional complexity. *Natural Language & Linguistic Theory*, 25:447–483.

Beck, S. and Johnson, K. (2004). Double objects again. *Linguistic Inquiry*, 35(1):97–123.

Bruening, B. (2018). Depictive secondary predicates and small clause approaches to argument structure. *Linguistic Inquiry*, 49(3):537–559.

Cresswell, M. (1977). Adverbs of space and time. In Guenthner, F. and Schmidt, S., editors, *Formal semantics and pragmatics for natural languages*, pages 171–199. Dordrecht/Boston: Reidel.

Dowty, D. (1979). *Word meaning and Montague Grammar*. Dordrecht: D. Reidel Publishing.

Harley, H. (2005). How do verbs get their names? Denominal verbs, manner incorporation, and the ontology of verb roots in English. In Erteschik-Shir, N. and Rapaport, T., editors, *The syntax of aspect: Deriving thematic and aspectual interpretation*, pages 42–64. New York: Oxford University Press.

Hoekstra, T. (1988). Small clause results. *Lingua*, 74(2-3):101–139.

Kayne, R. (1984). Principles of participle constructions. In Guéron, J., Obenauer, H.-G., and Pollock, J.-Y., editors, *Grammatical representation*, pages 101–140. Dordrecht: Foris.

Kratzer, A. (1996). Severing the external argument from its verbs. In Ann Zaring, L. and Rooryck, J., editors, *Phrase structure and the lexicon*, pages 109–137. Kluwer, Dordrecht.

Kratzer, A. (2005). Building resultatives. In Maienborn, C. and Wöllstein, A., editors, *Event arguments: Foundations and applications*, pages 177–212. Tübingen: Niemayer.

Pylkkänen, L. (2008). *Introducing arguments*. Cambridge, MA: MIT Press.

Rappaport-Hovav, M. and Levin, B. (1998). Building verb meanings. In Butt, M. and Geuder, W., editors, *The projection of arguments: Lexical and compositional factors*, pages 97–134. Stanford, CA: CSLI Publications.

Rappaport Hovav, M. and Levin, B. (2001). An event structure account of english resultatives. *Language*, pages 766–797.

Rappaport-Hovav, M. and Levin, B. (2010). Reflections on manner/result complementarity. In Doron, E., Rappaport-Hovav, M., and Sichel, I., editors, *Syntax, lexical semantics, and event structure*, pages 21–38. Oxford: Oxford University Press.

Rawlins, K. (2013). On adverbs of (space and) time. In Arsenijević, B. et al., editors, *Studies in the composition and decomposition of event predicates*, pages 153–193. Dordrecht: Springer.

Rothstein, S. (2004). *Structuring events: A study in the semantics of aspect*. Wiley Blackwell.

Smith, R. W. and Yu, J. (2021). Agentless presuppositions and the semantics of verbal roots. *Natural Language & Linguistic Theory*, 40(3):875–909.

Washio, R. (1997). Resultatives, compositionality and language variation. *Journal of East Asian Linguistics*, 6(1):1–49.

Williams, A. (2007). Objects in resultatives. Manuscript, University of Maryland.

Williams, A. (2015). *Arguments in syntax and semantics*. Cambridge: Cambridge University Press.

Zhang, N. N. (2022). Agentless presupposition and implicit and non-canonical objects in Mandarin. *Cahiers de Linguistique Asie Orientale*, 51(1):81–104.