

VARIATION, AMBIGUITY, AND NOUN CLASSES IN ENGLISH

Arto Anttila
Stanford University

- (1) Collaborators: Vivienne Fong (co-author), Cathy O'Connor, Joan Maling, Fred Karlsson, Gregory Garretson, Barbora Skarabela, NSF Grant #BCS-0080377 to O'Connor.
- (2) VARIATION and AMBIGUITY in English genitive constructions:
 a. my parents' house ~ the house of my parents ('the house owned by my parents')
 b. the performance of Aida ('A performed something' / 'Someone performed A')
- (3) One meaning, one form Variation Ambiguity
- | | | |
|---|--------|---------|
| M | M | M1 M2 |
| | / \ | / \ |
| F | F1 F2 | F |
- (4) Why is this interesting?
- Variation/ambiguity in English genitives is extremely common.
 - Systematic, but rarely studied PREFERENCES, both in expression and interpretation.
- (5) Goals:
- Show how variation, ambiguity, preferences in expression and interpretation, can be derived from ranked and violable constraints (Prince and Smolensky, 1993).
 - Show that the same theory generalizes to an apparently unrelated domain: the typology of argument linking patterns in nouns.

1. The phenomena

1.1 Variation

- (6) a. But the earth came to the help of the woman, and the earth opened its mouth and swallowed the river which the dragon had poured from his mouth. (Revelations 12: 16, Revised Standard Version)
- b. But the earth came to the woman's help: it opened its mouth and drank up the river which the Dragon had poured from his mouth. (Weymouth New Testament)
- (7) the land of the dead man ~ the dead man's land
 the son of a Scottish man ~ a Scottish man's son
 the ear of Mrs. Coolidge ~ Mrs. Coolidge's ear
 the explosion of the rifle ~ the rifle's explosion
- (Garretson, Skarabela and O'Connor 2002)

- | | | | |
|-----|----|---|--|
| (8) | a. | Boston's Mr. and Mrs. Frank Stearns
Mr. and Mrs. Frank Stearns of Boston | unique couple
non-unique couple |
| | b. | <u>his</u> thought
the thought of <u>him</u> | subjective reading
objective reading |
| | c. | We'll meet at <u>the house of Ann Smith</u> .
We'll meet at <u>Ann Smith's house</u> . | new information
old information (Deane, 1987) |
| (9) | a. | Transactions of the Philological Society
Philological Society's Transactions | title page
back cover (Jespersen, 1949: 314) |
| | b. | someone's head
the head of someone | ?
? |

"You cannot shave the head of someone when he is not there," he added. (Google)
It's not beyond science's reach to put someone's head on a new body. (Google)

- | | | |
|------|----|--|
| (10) | a. | <u>The English of the king</u> varied widely at times from <u>the king's English</u> |
| | b. | <u>The Lord's Day</u> 'Sunday' vs. <u>the Day of the Lord</u> 'Judgment Day'
(Jespersen, 1949:314, 318) |

1.2 Ambiguity

- (11) An attorney, not celebrated for his probity, was robbed one night on his way from Wicklow to Dublin. His father, meeting Baron O'Grady the next day, said: "My Lord, have you heard of my son's robbery?" "No indeed", replied the Baron, "pray whom did he rob?" (Hodgson, *Errors in the Use of English 91*, cited in Jespersen, 1940: 67)
- (12) Ambiguity, Type 1: Deverbal nouns have SUBJECTIVE vs. OBJECTIVE readings (*s*-genitive, *of*-genitive):
- | | |
|----|---|
| a. | We also have the duty to appraise realistically and honestly <u>their performance</u> . |
| b. | President Kennedy has expressed his dissatisfaction with <u>its performance</u> . |
| c. | Splendid, too, is <u>the performance of Yuri Tolubeyev</u> . |
| d. | The play was to be <u>a benefit performance of the Octoroon</u> . |
- (13) Ambiguity, Type 2: Relational nouns (Barker and Dowty 1993) have EXTRINSIC vs. LEXICAL readings (*s*-genitive):
- | | |
|----|---|
| a. | <u>His pictures</u> were roundly denounced as the most disgusting things one has ever seen in Vienna. |
| b. | She doesn't want a complete wardrobe from any one designer any more than she wants all of <u>her pictures</u> by one painter. |
- (14) Terminology: objective/lexical = INTERNAL, subjective/extrinsic = EXTERNAL
- (15) Ambiguity, Type 3: Uniqueness (’*s*-genitive, Barker, 1995: 78, Taylor, 1996: 262-3):
- | | |
|----|--|
| a. | <u>My sister</u> is getting married next week. |
| b. | She is having problems with <u>her PhD student</u> . |

1.3 Preferences in expression, preferences in interpretation

- (16) No obvious difference in meaning, but one variant sounds better than the other:
 a. its removal ~ ?the removal of it
 b. ?the tree's removal ~ the removal of the tree (Grimshaw 1990:87)
- (17) Several readings are possible, but some are more easily accessible than others:
Aida's performance
 a. 'the performance by Aida' (external reading)
 b. 'a performance by Aida' (external reading)
 c. 'the performance of Aida' (internal reading)
 d. 'a performance of Aida' (internal reading)

1.4 No variation, no ambiguity

- (18) a. *the hospitals of us our hospitals
 b. the destruction of cities *cities' destruction
 c. a ring of gold *gold's ring
 d. most of the time *the time's most
- (19) a. I appreciate your contribution to the performance of it. (internal only, cf. (12))
 b. Shakespeare gives us a vivid picture of Shylock. (internal only, cf. (13))
 c. This is a picture of her. (internal only, cf. (13))

1.5 Summary

VARIATION	NO VARIATION
1a. <i>Pat's picture ~ the picture of Pat</i>	2a. <i>some of my pictures / *my pictures' some</i>
1b. <i>my picture ~ the picture of me</i>	
1c. <i>John's performance ~ the performance of John</i>	
1d. <i>the opera's performance ~ the performance of the opera</i>	
1e. <i>its performance ~ the performance of it</i>	
1f. <i>God's love ~ the love of God</i>	
1g. <i>?the tree's removal ~ the removal of the tree</i>	
1h. <i>its removal ~ ?the removal of it</i>	
1i. <i>Pat's cat ~ ?the cat of Pat</i>	

AMBIGUITY	NO AMBIGUITY
3a. <i>Pat's picture</i> 'picture representing Pat' 'picture owned by Pat' 3b. <i>the love of God</i> 'God loves someone' (external) 'someone loves God' (internal) 3c. <i>Aida's performance</i> 'performance by Aida' (external) 'performance of Aida' (internal) 3d. <i>the performance of Aida</i> 'performance by Aida' (external) 'performance of Aida' (internal)	4a. <i>the picture of Pat</i> 'picture representing Pat' 4b. <i>God's love</i> 'God loves someone' (external) 4c. <i>the performance of it</i> 'performance of it' (internal)

1.6 Empirical generalizations

(20) THE BARKER-DOWTY GENERALIZATION: If a noun can take a genitive *of*-phrase and if the *of*-phrase can also be paraphrased by a prenominal possessive, then we can generally assume that [the] noun has the appropriate relational sense (Barker and Dowty 1993).

- a. my picture ~ a picture of me
- b. my cat/*a cat of me

(21) Problems:

- a. the office of the superintendent ~ the superintendent's office
the new firetruck of the fire department ~ the fire department's new firetruck
- b. my nose/*the nose of me
the destruction of cities/*cities' destruction

(22) THE PRONOUN GENERALIZATION: Pronouns are preferred in the Specifier position and dispreferred in the Complement position. Non-pronouns show the reverse pattern.

- a. ?the tree's removal ~ the removal of the tree
- b. its removal ~ ?the removal of it

(23) Problems: (22) is only a quantitative tendency.

- a. The tree's removal has sparked a reaction on campus. (Google)
- b. Since the hair is a woman's glory, then isn't the removal of it the removal of her glory? (Google)

(24) THE NOUN CLASS OBSERVATION: Different relational nouns show different ambiguity patterns (E = external, I = internal):

a.	Aida's performance	(E~I)	the performance of Aida	(E~I)
	the tribe's discovery	(E~I)	the discovery of the tribe	(E~I)
	the company's donation	(E~I)	the donation of the company	(E~I)
b.	God's love	(E)	the love of God	(E~I)
	God's knowledge	(E)	the knowledge of God	(E~I)
	the enemy's fear	(E)	the fear of the enemy	(E~I)
c.	Clinton's picture	(E~I)	the picture of Clinton	(I)
	Clinton's portrait	(E~I)	the portrait of Clinton	(I)
	Clinton's statue	(E~I)	the statue of Clinton	(I)
d.	Clinton's sketch	(E)	the sketch of Clinton	(I)
	Clinton's painting	(E)	the painting of Clinton	(I)

(25) The lexical variation has strict limits. Some nonexistent patterns:

a.	Pat's quain	(I)	the quain of Pat	(E)
b.	Pat's quain	(I)	the quain of Pat	(E~I)
c.	Pat's quain	(E~I)	the quain of Pat	(E)

(26) Summary:

- The Barker-Dowty Generalization and the Pronoun Generalization are typical examples of regularities that are VIOLABLE and/or QUANTITATIVE.
- The Noun Class Observation is another aspect of the same problem: we need to explain the systematic restrictions, but also accommodate the lexical diversity.

2. An approach to meaning-form mapping

(27) Questions:

- Why do we find certain patterns of variation and ambiguity, but not others?
- How to explain the quantitative preferences in variation and ambiguity?

2.1 Inputs and outputs

(28) An OT grammar defines a set of possible mappings between meanings and forms.

(29) Sample meanings (Barker 1995):

a.	$\lambda x(\pi(\mathbf{john}, x) \wedge \mathbf{cat}_{[\text{specific, definite}]}(x))$	'the cat in some extrinsic relation with John'
b.	$\lambda x(\mathbf{child}_{[\text{specific}]}(\mathbf{john}, x))$	'a child of John'

(30) Simplified notation:

$R\{e,i\}$	Relation is external ("e") or internal ("i").
$\{a, \text{the}\} N$	The possessum is specific ("a") or specific and definite ("the").
$\{\text{PRO}, \text{NP}\}$	The possessor is a pronoun ("PRO") or a non-pronoun ("NP").

- (31) Sample forms:
- a. *John's cat*_[specific, definite] ('s-genitive)
 - John's child*_[specific, definite]
 - b. *the cat of John*_[specific, definite] (of-genitive)
 - a child of John*_[specific]
- (32) Assumptions (Woisetschlaeger, 1983; Barker, 1995: 78; Taylor, 1996: 187-204):
- a. *the, my, your, his, her, its, our, their, 's* express [specific, definite]
 - b. *a(n)* expresses [specific]

2.2 Constraints

- (33) Markedness:
- a. *C 'No Complement'
 - b. *S 'No Specifier'
- (34) Three prominence scales:
- a. Animacy Hierarchy: Pronoun > Non-pronoun
 - b. Argument Hierarchy: External > Internal (Grimshaw, 1990)
 - c. Structural Hierarchy: Specifier > Complement

(35) Harmonic alignment (Prince and Smolensky, 1993: 139):

Scales	Harmonic Alignment	Constraint Alignment
Pronoun > Non-Pronoun	S/P > _H S/NONP	$\left\{ \begin{array}{l} *C/P \\ *S/NONP \end{array} \right\} \gg \left\{ \begin{array}{l} *S/P \\ *C/NONP \end{array} \right\}$
Specifier > Complement	C/NONP > _H C/P	

Scales	Harmonic Alignment	Constraint Alignment
External > Internal	S/E > _H S/I	$\left\{ \begin{array}{l} *S/I \\ *C/E \end{array} \right\} \gg \left\{ \begin{array}{l} *S/E \\ *C/I \end{array} \right\}$
Specifier > Complement	C/I > _H C/E	

- (36) Active constraints:
- a. *S/I 'No Specifier with an internal argument' (Koopman and Sportiche, 1991; Bernstein, 2001)
 - b. *C/P 'No Complement with a pronoun' (Giorgi and Longobardi, 1991; Cardinaletti and Starke, 1999; cf. also Babyonyshev, 2002)
 - c. *S/NONP 'No Specifier with a non-pronoun'
- (37) An alternative analysis: The last two constraints are prosodic [see handout #5].

- (38) Faithfulness:
- a. MAX 'Express meaning present in the input'
 - b. DEP 'Do not express meaning not present in the input'
- (39) Examples of faithfulness violations:
- a. 'the cat of John' * \rightarrow *a cat of John*_[specific] MAX-violation ([definite])
 - b. 'a child of John' ? \rightarrow *John's child*_[specific, definite] DEP-violation ([definite])
 - c. 'a sister of mine' \rightarrow *my sister*_[specific, definite] DEP-violation ([definite])
- (40) Two special cases: partitive constructions and generic possessors
- a. some of us *our some
 - most of the time *the time's most
 - two or three of my friends *my friends' two or three
 - one of them *their one
 - b. a ring of gold *gold's ring
 - a state of shock *shock's state
 - a man of brooding suspicions *brooding suspicions' man
 - the goal of human dignity *human dignity's goal
- (41) For now, we will assume the following descriptive constraints:
- a. In partitives, the genitive phrase is in the Complement (undominated)
 - b. No non-specific Specifiers (undominated, cf. Taylor 1996, Ch. 7)

2.3 Deriving variation

- (42) In order to rank two constraints, we must find data where they CONFLICT. This presupposes categorical well-formedness contrasts such as *my cat*/**the cat of me*.
- (43) Problem: there are very few categorical contrasts, so ranking is nearly impossible.
- (44) The starting point: pronoun/relational noun interactions. 4 possible input types:
- a. Pronominal genitive phrase, non-relational noun (e.g. *my cat*)
 - b. Pronominal genitive phrase, relational noun (e.g. *a picture of him*)
 - c. Non-pronominal genitive phrase, non-relational noun (e.g. *Clinton's cat*)
 - d. Non-pronominal genitive phrase, relational noun (e.g. *a picture of Clinton*)
- (45) Motivation for *C/P >> *S: 'the cat owned by me' \rightarrow *my cat*

Re (the cat, PRO)	MAX	*C/P	*C	*S
(a) \rightarrow <i>my cat</i> _[specific, definite]				*
(b) * <i>the cat of me</i> _[specific, definite]		*	*	
(c) * <i>a cat of me</i> _[specific]	*	*	*	

- (46) Note the contrast between non-relational and relational nouns:
- a. You're my man. *You're the man of me.
 Get your timing right! *Get the timing of you right!
 All he knows is his music. *All he knows is the music of him.
 our hospitals *the hospitals of us
 Their flight was delayed. *The flight of them was delayed.
- b. pictures of me the length of it the likes of me
 the memory of him the sight of me in the forefront of him
 a combination of them to the west of us the name of it
 on the other side of her through fear of him the real cause of them

(47) Variation: 'the picture representing me' → *the picture of me* ~ *my picture*

Ri (the picture, PRO)	MAX	*S/I	*C/P	*C	*S
(a) my picture _[specific, definite]		*!			*
(b) → the picture of me _[specific, definite]			*	*	
(c) a picture of me _[specific]	*!		*	*	
	MAX	*C/P	*S/I	*C	*S
(a) → my picture _[specific, definite]			*		*
(b) the picture of me _[specific, definite]		*!		*	
(c) a picture of me _[specific]	*!	*		*	

- (48) Quantitative interpretation (Anttila 1997): The number of total rankings that generate each output is proportional to the probability of occurrence of this output.
- (49) A&F's prediction: *my picture* is optimal by 80% and *the picture of me* by 20% of the total rankings compatible with *C/P >> *S. This quantitative bias comes from the ranking *C/P >> *S which prefers *my picture* over *the picture of me*.
- (50) The same ranking may yield categorical or quantitative effects, depending on the input.
- (51) Variation is also predicted in the following two cases [no tableaux shown]:
- (a) 'the cat owned by Mr. Clinton' → *Mr. Clinton's cat* ~ *the cat of Mr. Clinton*
 (b) 'the picture representing Mr. Clinton' → *Mr. C's picture* ~ *the picture of Mr. C*

(52) Motivation for *C/P >> DEP: 'a cat owned by me' → *my cat*

Re (a cat, PRO)	*C/P	DEP	*C	*S
(a) → my cat _[specific, definite]		*		*
(b) *a cat of me _[specific]	*!		*	
(c) *the cat of me _[specific, definite]	*!	*	*	

2.4 Typology and T-orders

(53) With seven constraints, we have a factorial typology of $7! = 5040$ grammars. The typology yields 14 distinct output patterns (Table 1).

Table 1: Factorial Typology

	Input	Output #1	Output #2	Output #3	Output #4
1	Re(the N, PRO)	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>
2	Re(the N, NP)	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>
3	Re(a N, PRO)	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>
4	Re(a N, NP)	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>	a N of NP
5	Ri(the N, PRO)	<i>PRO's N</i>	<i>PRO's N</i>	the N of PRO	<i>PRO's N</i>
6	Ri(the N, NP)	<i>NP's N</i>	the N of NP	the N of NP	<i>NP's N</i>
7	Ri(a N, PRO)	<i>PRO's N</i>	<i>PRO's N</i>	a N of PRO	<i>PRO's N</i>
8	Ri(a N, NP)	<i>NP's N</i>	a N of NP	a N of NP	a N of NP

	Output #5	Output #6	Output #7	Output #8	Output #9
1	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>
2	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>	<i>NP's N</i>
3	<i>PRO's N</i>	<i>PRO's N</i>	a N of PRO	a N of PRO	a N of PRO
4	a N of NP	a N of NP	a N of NP	a N of NP	a N of NP
5	<i>PRO's N</i>	the N of PRO	<i>PRO's N</i>	<i>PRO's N</i>	the N of PRO
6	the N of NP	the N of NP	<i>NP's N</i>	the N of NP	the N of NP
7	<i>PRO's N</i>	a N of PRO	a N of PRO	a N of PRO	a N of PRO
8	a N of NP	a N of NP	a N of NP	a N of NP	a N of NP

	Output #10	Output #11	Output #12	Output #13	Output #14
1	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	<i>PRO's N</i>	the N of PRO
2	the N of NP	the N of NP	the N of NP	the N of NP	the N of NP
3	<i>PRO's N</i>	<i>PRO's N</i>	a N of PRO	a N of PRO	a N of PRO
4	a N of NP	a N of NP	a N of NP	a N of NP	a N of NP
5	<i>PRO's N</i>	the N of PRO	<i>PRO's N</i>	the N of PRO	the N of PRO
6	the N of NP	the N of NP	the N of NP	the N of NP	the N of NP
7	<i>PRO's N</i>	a N of PRO	a N of PRO	a N of PRO	a N of PRO
8	a N of NP	a N of NP	a N of NP	a N of NP	a N of NP

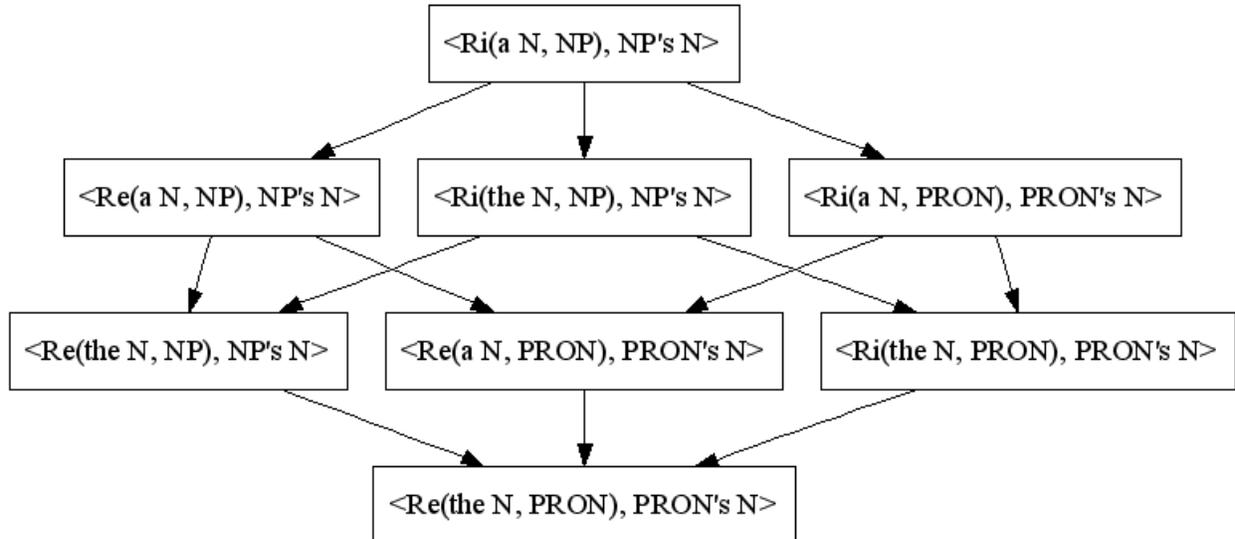
(54) Some implicational universals: If a pronoun possessor is possible in the complement position, then so is a non-pronoun possessor.

(55) This corresponds to four implicational universals stated as pairs of <input, output> pairs:

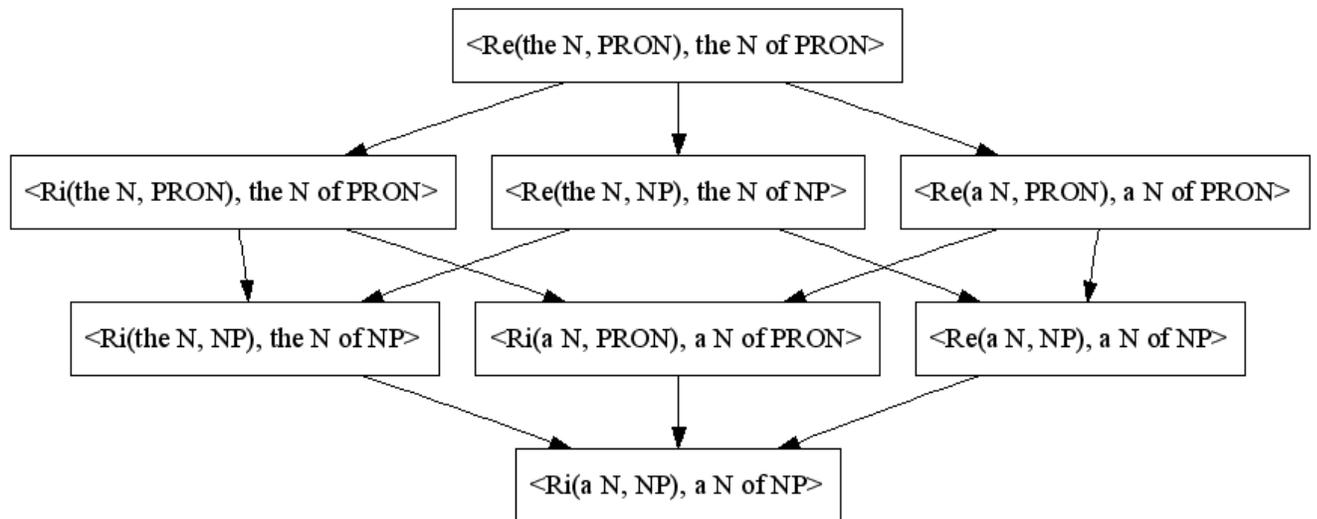
<Re(the N, PRO), the N of PRO >	→	<Re(the N, NP), the N of NP >
<Re(a N, PRO), a N of PRO >	→	<Re(a N, NP), a N of NP >
<Ri(the N, PRO), the N of PRO >	→	<Ri(the N, NP), the N of NP >
<Ri(a N, PRO), a N of PRO >	→	<Ri(a N, NP), a N of NP >

(56) T-orders for 's-genitives and *of*-genitives:

a. 's-genitives



b. *of*-genitives



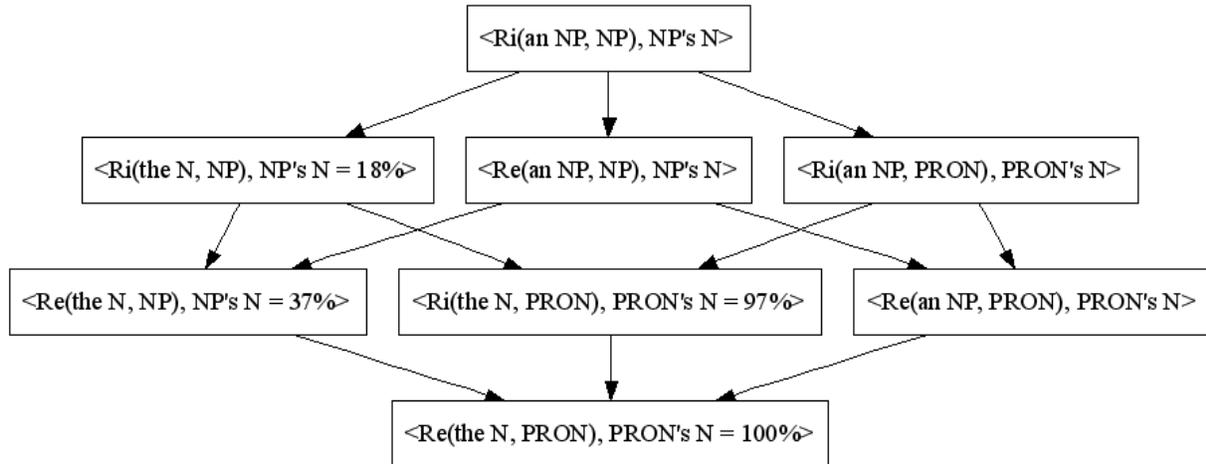
(57) Testing the predictions on the Brown Corpus (Francis and Kučera 1982):

- 17 relational nouns (1,116 tokens) based on Barker and Dowty 1993: *hand, head, heart, leg, nose* (body part nouns); *friend, wife* (kinship nouns); *color, length, shape* (function nouns); *corner, edge, middle, point, side, surface, top* (topological properties).
- 37 non-relational nouns (1,147 tokens): *body, boy, business, car, city, church, country, day, fact, field, god, law, life, line, man, moment, money, night, number, office, place, power, problem, program, public, school, system, thing, voice, war, water, week, woman, word, world, work, year*.

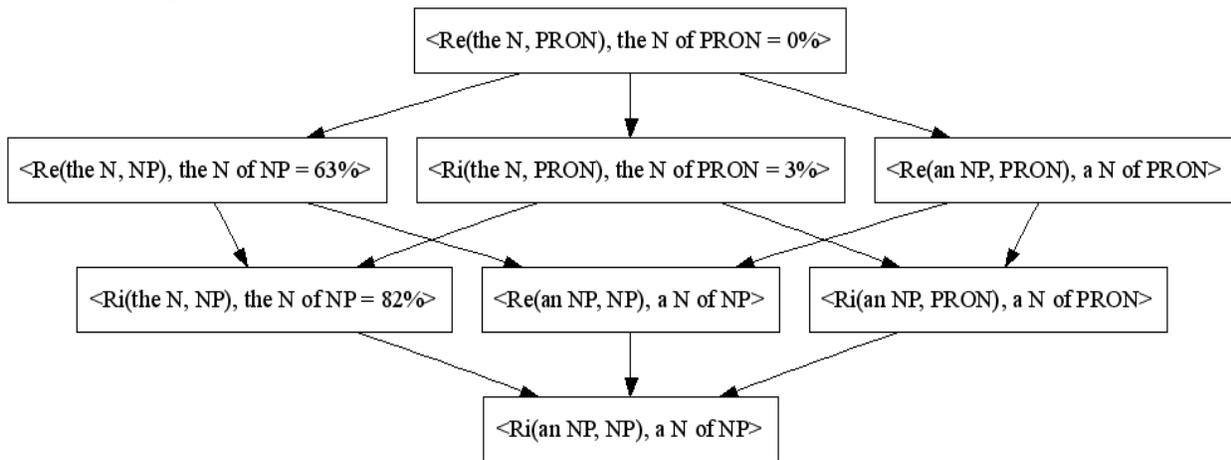
(58) Only definite noun phrases (*the street's corner, the corner of the street*) were included.

(59) Variation data: percentage of all <input, output> mappings for a given input

a. 's-genitives



b. of-genitives



(60) The relative grammaticality of variants for the same input cannot be read off the T-order. However, they follow from the analysis, given the quantitative interpretation in (48).

(61) Examples of preferences among variants for the same input

EXPRESSION

a. its removal by Mary

b. ??the tree's removal by Mary

c. during the course of its digestion by worms

d. ??during the course of the food's digestion by worms.

COMPETITOR

the removal of it

the removal of the tree

the digestion of it

the digestion of the food

(from Grimshaw 1990:87, citing Kayne 1984)

(62) Predictions and observations (preliminary data):

	Predictions		Observations		N of tokens, total = 2,263
	Spec	Comp	Spec	Comp	
a. Non-relational noun + pronoun <i>my cat / *the cat of me</i>	100%	0%	100%	0%	611
b. Relational noun + pronoun <i>my picture ~ the picture of me</i>	80%	20%	97%	3%	624
c. Non-relational noun + non-pronoun <i>Mr. C's cat ~ the cat of Mr. C</i>	40%	60%	37%	63%	536
d. Relational noun + non-pronoun <i>Mr. C's picture ~ the picture of Mr C.</i>	29%	71%	18%	82%	492

(63) PREDICTIONS:

its removal, 0.8

??*the tree's removal*, 0.29

its digestion, 0.8

??*the food's digestion*, 0.29

(*the removal of it*, 0.2)

(*the removal of the tree*, 0.71)

(*the digestion of it*, 0.2)

(*the digestion of the food*, 0.71)

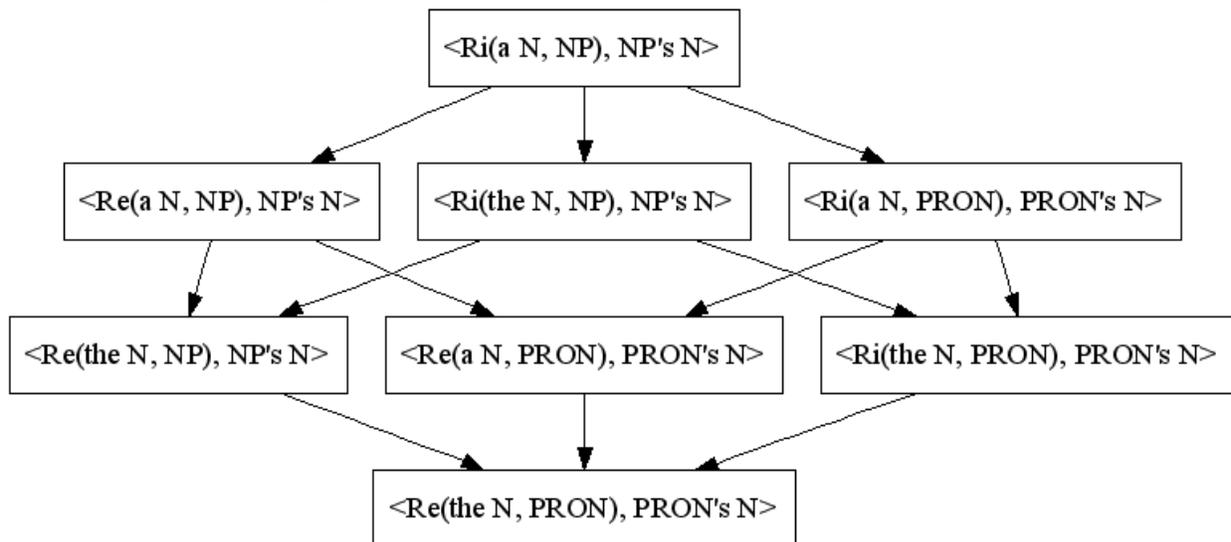
2.5 Deriving ambiguity

(64) *Aida's performance*: 'the performance by Aida' (E), 'the performance of Aida' (I)

(65) The argument:

- Grammatical knowledge is involved in determining the preferred reading.
- A grammatical theory that only makes qualitative distinctions cannot provide any rationale for such preferences, predicting that they are extragrammatical in nature.
- The grammatical theory explored here provides such a rationale.

(66) Ambiguity = one output, multiple inputs. The T-order imposes a preference ordering on alternative readings:



(67) Preliminary ambiguity data for six picture nouns (*picture, statue, sketch, painting, photograph, portrait*). The numbers indicate absolute frequencies of readings in the Brown corpus, 73 tokens in all.

1. the N of NP:
 - Preferences:
 - Ri(the N, NP) > Re(the N, NP) 27 > 1
2. NP's N:
 - Preferences:
 - Re(an NP, NP) > Ri(an NP, NP) 0 > 0
 - Re(the N, NP) > Ri(an NP, NP) 1 > 0
 - Re(the N, NP) > Ri(the N, NP) 1 > 0
 - Ri(the N, NP) > Ri(an NP, NP) 0 > 0
 - Re(the N, NP) > Re(an NP, NP) 1 > 0
3. PRON's N:
 - Preferences:
 - Re(an NP, PRON) > Ri(an NP, PRON) **0 > 2 ?**
 - Re(the N, PRON) > Ri(an NP, PRON) 4 > 2
 - Re(the N, PRON) > Ri(the N, PRON) 4 > 4
 - Ri(the N, PRON) > Ri(an NP, PRON) 4 > 2
 - Re(the N, PRON) > Re(an NP, PRON) 4 > 0
4. the N of PRON:
 - Preferences:
 - Ri(the N, PRON) > Re(the N, PRON) 0 > 0
5. a N of NP:
 - Preferences:
 - Ri(an NP, NP) > Re(an NP, NP) 31 > 0
6. a N of PRON:
 - Preferences:
 - Ri(an NP, PRON) > Re(an NP, PRON) 3 > 0

(68) Identifying the intended reading can be difficult:

a. I remember her because she didn't want her picture in the paper. [Interpretation: internal (wedding photo).]

b. And when the child dies in Lawrence's story in a delirium that is somehow brought on by his mania to win and to make his mother rich, the manifest absurdity of such a disease and such a death does not enter into our thoughts at all. [Interpretation: external]

c. Grigorss, at seventeen, learns his story and goes forth as a knight to uncover his origins. [Interpretation: internal]

d. Martin guessed that Dolores would not be eager to tell the next installment of her story. [Interpretation: ???]

(69) The current grammar makes specific predictions about the probability of different readings.

(70) Quantitative interpretation (generalized to include ambiguity, see Anttila and Fong 2000):
The number of total rankings that generate an <input, output> mapping is proportional to the probability of this mapping.

(71) Predicted interpretation probabilities

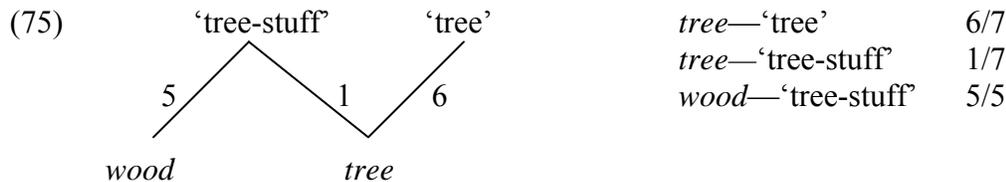
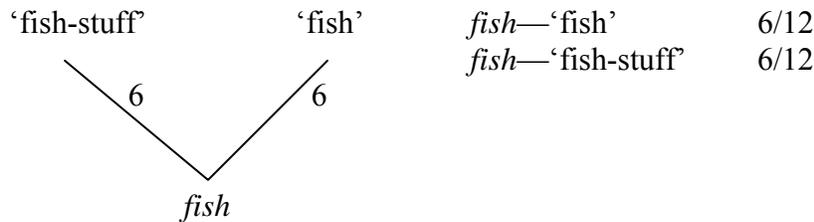
'the performance by Aida' (external, definite)	0.31	} <i>Aida's performance</i>
'a performance by Aida' (external, indefinite)	0.27	
'the performance of Aida' (internal, definite)	0.22	
'a performance of Aida' (internal, indefinite)	0.20	
'the performance of Aida' (internal, definite)	0.54	} <i>the performance of Aida</i>
'the performance by Aida' (external, definite)	0.46	

(72) The definition in (69) amounts to a theory of BLOCKING (Aronoff, 1976; Kiparsky, 1982; Briscoe et al., 1995; Copestake and Briscoe, 1995; Blutner, 2000).

(73) Example: Conceptual grinding (e.g. Pelletier and Schubert, 1989).

- a. This is a fish vs. We had fish for dinner.
 b. This is a tree. vs. ??This table is made of tree.

(74) Assume a grammar with 6 total rankings (= <input, output> mappings):



(76) The expression *wood* reduces the number of <'tree-stuff', *tree*> mappings to one because the number of total rankings in the grammar (*t*) is constant, hence (partial) blocking.

2.6 Summary

- (77) One and the same grammar derives three kinds of facts:
- Categorical judgments, e.g. *my cat*, **the cat of me*, **a cat of me*
 - Variation, preferences in expression
 - Ambiguity, preferences in interpretation
- (78) Evidence from all three sources should converge.

3. Deriving noun classes

3.1 The facts

- (79) Classes of relational nouns

NOUN CLASS	GENITIVE PHRASE	'S-GENITIVE READINGS	OF-GENITIVE READINGS
<i>performance</i>	PRONOUN	E~I <i>its performance</i>	I <i>the performance of it</i>
	NON-PRONOUN	E~I <i>Aida's performance</i>	E~I <i>the performance of Aida</i>
<i>picture</i>	PRONOUN	E~I <i>my picture</i>	I <i>the picture of me</i>
	NON-PRONOUN	E~I <i>Clinton's picture</i>	I <i>the picture of Clinton</i>
<i>love</i>	PRONOUN	E <i>her love</i>	I <i>the love of her</i>
	NON-PRONOUN	E <i>God's love</i>	E~I <i>the love of God</i>
<i>expression</i>	PRONOUN	E~I <i>its expression</i>	I <i>the expression of it</i>
	NON-PRONOUN	E <i>Pat's expression</i>	I <i>the expression of anger</i>
<i>sketch</i>	PRONOUN	E <i>my sketch</i>	I <i>the sketch of me</i>
	NON-PRONOUN	E <i>Clinton's sketch</i>	I <i>the sketch of Clinton</i>
<i>brother</i>	PRONOUN	E~I <i>my brother</i>	∅ --
	NON-PRONOUN	E~I <i>Pat's brother</i>	I <i>the brother of Clinton</i>

- (80) More examples:
- performance*-nouns: performance, robbery, conquest, discovery, examination, donation, summary, write-up, declaration, review, destruction, promulgation
 - picture*-nouns: picture, photograph, portrait, statue, history, biography, story, draft, version, name, birthday
 - love*-nouns: love, fear, admiration, knowledge, ignorance, desire, survey, account, criticism, contribution, news, report, statement, most *-ing* forms
 - expression*-nouns: expression, avoidance
 - sketch*-nouns: sketch, tale, painting, part
 - brother*-nouns: brother, sister, wife, hand, nose, child, mother
- (81) Hypothesis 1: Noun classes are grounded in lexical semantics, e.g. thematic roles, aspectual structure, affectedness of arguments, etc. (Anderson, 1979; Grimshaw, 1990; Doron and Rappaport-Hovav, 1991; Taylor, 1996; cf. Levin, 1993, for verbs).

- (82) This is probably in the right direction, but there are problems:
- a. *picture* vs. *nose*, *picture* vs. *sketch*, *picture* vs. *painting*
 - b. Many *performance*-nouns are action nouns, but cf. *discovery*, *examination*, *review*, *donation*.
 - c. Many *picture*-nouns are representational, but cf. *name*, *birthday*.
 - d. Many *love*-nouns derive from cognitive verbs, but cf. *criticism*, *contribution*, *-ing*
- (83) The same verbs behave differently in different languages:
- a. The description of Mary was inaccurate. (only internal reading)
 - b. La descrizione di Maria non era accurata. (external or internal reading)
(Giorgi and Longobardi, 1991: 121-2):
- (84) Conclusion: The noun classes are not semantically completely arbitrary, but not completely predictable either.

3.2 A subregularity interpretation of OT grammars

- (85) Hypothesis 2: The grammar of English *C/P >> *S, *C/P >> DEP defines the space of possible lexical variation (1,680 total rankings).
- (86) A subregularity interpretation of OT grammars (Anttila, 2002): Different lexical items may subscribe to different partial orders within the grammar of a language.
- (87) 12 types of inputs, 1,680 total rankings
- (88) Sample ranking: *S/I >> *C/P >> DEP >> *S/NONP >> *C >> *S >> MAX

	HEAD	GENITIVE PHRASE	OUTPUT
1.	definite	pronominal, specific, external	<i>X's Y</i>
2.	definite	pronominal, specific, internal	<i>Y of X</i>
3.	definite	non-pronominal, specific, external	<i>Y of X</i>
4.	definite	non-pronominal, specific, internal	<i>Y of X</i>
5.	definite	non-pronominal, non-specific, external	<i>Y of X</i>
6.	definite	non-pronominal, non-specific, internal	<i>Y of X</i>
7.	indefinite	pronominal, specific, external	<i>X's Y</i>
8.	indefinite	pronominal, specific, internal	<i>Y of X</i>
9.	indefinite	non-pronominal, specific, external	<i>Y of X</i>
10.	indefinite	non-pronominal, specific, internal	<i>Y of X</i>
11.	indefinite	non-pronominal, non-specific, external	<i>Y of X</i>
12.	indefinite	non-pronominal, non-specific, internal	<i>Y of X</i>

(89) The typology of input-output mappings

		RANKING TYPES							
		I	II	III	IV	V	VI	VII	VIII
INPUT TYPES		N = 224	N = 98	N = 14	N = 42	N = 28	N = 448	N = 42	N = 784
	1.	X's Y							
	2.	Y of X	Y of X	Y of X	X's Y				
	3.	Y of X	X's Y	Y of X					
	4.	Y of X	X's Y	X's Y	Y of X				
	5.	Y of X							
	6.	Y of X							
	7.	X's Y							
	8.	Y of X	Y of X	Y of X	X's Y				
	9.	Y of X	X's Y	Y of X	X's Y	Y of X	X's Y	Y of X	Y of X
	10.	Y of X	X's Y	Y of X	Y of X				
	11.	Y of X							
12.	Y of X								

(90) 6 predicted types of ambiguity, at least 5 are attested:

	SPEC	COMP	GENITIVE PHRASE	EXAMPLE
a.	E	I	specific	<i>Pat's sketch ~ a sketch of Pat</i>
b.	E~I	--	specific	<i>my brother ~ *the brother of me</i>
c.	--	E~I	non-pronominal	?
d.	E~I	I	specific	<i>Pat's picture ~ the picture of Pat</i>
e.	E	E~I	specific	<i>God's love ~ the love of God</i>
f.	E~I	E~I	specific, non-pron.	<i>Aida's performance ~ the performance of Aida</i>

(91) Excluded patterns

a.	Pat's quain	(I)	the quain of Pat	(E)
b.	Pat's quain	(I)	the quain of Pat	(E~I)
c.	Pat's quain	(E~I)	the quain of Pat	(E)
d.	Pat's quain	(E)	the quain of Pat	(E)
e.	Pat's quain	(I)	the quain of Pat	(I)
f.	its quain	(E~I)	the quain of it	(E~I)

(92) The corresponding partial orders:

<i>performance</i>	English
<i>picture</i>	English \cup { *C >> *S/NONP, *C >> *S }
<i>love</i>	English \cup { *S/I >> *C, *S/I >> *C/P }
<i>expression</i>	English \cup { *S/I >> *C, *C >> *S/NONP, *C >> *S }
<i>sketch</i>	English \cup { *S/I >> *C, *C >> *S/NONP, *S/I >> *C/P, *C >> *S }
<i>brother</i>	English \cup { *C/P >> *S/I, *C >> *S/NONP, *C >> *S }

4. Future directions

- Subtler distinctions in semantic relations (Hawkins, 1981; Pustejovsky, 1995; Borschev and Partee, 2002; Jensen and Vikner, 2002), nominalization types (Grimshaw, 1990), animacy and referentiality (Altenberg, 1982; Rosenbach, to appear), and thematic roles
- Discourse effects (Deane, 1987; Anschutz, 1997; O'Connor, 1999a,b)
- Grammatical weight (Wasow, 1997; Arnold, Wasow, Losongco and Ginstrom, 2000, Anttila 2007)

5. Conclusions

- OT grammars relate four apparently independent phenomena:
 - a. categorical grammaticality contrasts
 - b. variation and preferences in expression
 - c. ambiguity and preferences in interpretation
 - d. lexical organization
- The same constraints yield both categorical and gradient effects.
- Variation, ambiguity, and the typology of argument linking are interconnected aspects of meaning-form mapping and follow from the same grammar.

References

- Aissen, J., 1997. On the syntax of obviation. *Language* 73, 705-750.
- Aissen, J. 1999. Markedness and subject choice in Optimality Theory. *Natural Language and Linguistic Theory* 17, 673-711.
- Allen, C., 1997. The origin of the 'group genitive' in English. *Transactions of the Philological Society* 95, 111-131.
- Altenberg, B., 1982. *The Genitive v. the of-construction: A Study of Syntactic Variation in 17th Century English*. Lund: CWK Gleerup.
- Anderson, M., 1979. *Noun Phrase Structure*. PhD thesis, University of Connecticut.
- Anttila, A., 1997. Deriving variation from grammar. In: Hinskens, F., van Hout, R., and Wetzels, W.L. (Eds.), *Variation and Change in Phonological Theory*. John Benjamins, Amsterdam, pp. 35-68.
- Anttila, A., 2002. Morphologically conditioned phonological alternations. *Natural Language and Linguistic Theory* 20, 1-42.
- Anttila, A., to appear. Derived Environment Effects in Colloquial Helsinki Finnish. In: Inkelas, S. and Hanson, K. (Eds.), *The Nature of the Word: Essays in Honor of Paul Kiparsky*. MIT Press, Cambridge, MA.
- Anttila, A. and Cho, Y.-m.Y. 1998. Variation and change in Optimality Theory. *Lingua* 104, 31-56.
- Anttila, A. and Fong, V., 2000. The partitive constraint in Optimality Theory. *Journal of Semantics* 17, 281-314.
- Anttila, A. and Fong, V., 2003. Variation, Ambiguity, and Noun Classes in English. ROA-589.
- Anttila, R., 1989. *Historical and Comparative Linguistics*. John Benjamins, Amsterdam.

- Anschutz, A., 1997. How to choose a possessive noun phrase construction. *Studies in Language* 21, 1-35.
- Arnold, J.E., Wasow, T., Losongco, A., and Ginstrom, R., 2000. Heaviness versus newness: The effects of structural complexity and discourse status on constituent ordering. *Language* 76, 28-55.
- Aronoff, M., 1976. *Word Formation in Generative Grammar*. MIT Press, Cambridge, MA.
- Asudeh, A., 2001. Linking, optionality, and ambiguity in Marathi. In Sells, P. (Ed.), *Formal and Empirical Issues in Optimality Theoretic Syntax*. CSLI, Stanford, CA, pp. 257-312.
- Babyonyshev, M., 2002. Deriving the restrictions on pronominal complements of nouns. Paper presented at the Workshop on the Semantics/Syntax of Possessive Constructions, University of Massachusetts, Amherst.
- Barker, C., 1995. *Possessive Descriptions*. CSLI, Stanford, CA.
- Barker, C., 2002. Metadefinite possessives. Paper presented at the Workshop on the Semantics/Syntax of Possessive Constructions, University of Massachusetts, Amherst.
- Barker, C. and Dowty, D., 1993. Non-verbal thematic proto-roles. In Shafer, A. (Ed.), *Proceedings of NELS 23, Volume 1*. GLSA, Amherst, pp. 49-62.
- Bernstein, J.B., 2001. The DP hypothesis. In: Baltin, M. and Collins, C. (Eds.), *The Handbook of Contemporary Syntactic Theory*. Blackwell, Malden, MA, pp. 536-561.
- Blutner, R., 2000. Some aspects of optimality in natural language interpretation. *Journal of Semantics* 17, 189-216.
- Boersma, P. 2001. Review of Arto Anttila (1997) "Variation in Finnish Phonology and Morphology". *Glott International* 5.1, 33-40.
- Boersma, P. and Hayes, B., 2001. Empirical tests of the Gradual Learning Algorithm. *Linguistic Inquiry* 32, 45-86.
- Borschev, V. and Partee, B.H., 2002. Genitives, types and sorts. Paper presented at the Workshop on the Semantics/Syntax of Possessive Constructions, University of Massachusetts, Amherst.
- Bresnan, J., 1997. The emergence of the unmarked pronoun: Chichewa pronominals in Optimality Theory. BLS 23. Berkeley, California, Berkeley Linguistic Society.
- Bresnan, J., 2001. Explaining morphosyntactic competition. In Baltin, M. and Collins, C. (Eds.), *The Handbook of Contemporary Syntactic Theory*. Blackwell, Malden, MA, pp. 11-44.
- Briscoe, T., Copestake, A., and Lascarides, A., 1995. Blocking. In Saint-Dizier, P. and Viegas, E. (Eds.), *Computational Lexical Semantics*. Cambridge University Press, Cambridge, pp. 273-302.
- de Bruin, J. and Scha, R., 1988. The interpretation of relational nouns. *Proceedings of the 26th Annual Meeting of the Association for Computational Linguistics (Buffalo)*, pp. 25-32.
- Cardinaletti, A. and Starke, M., 1999. The typology of structural deficiency: A case study of the three classes of pronouns. In: van Riemsdijk, H. (Ed.), *Clitics in the Languages of Europe*. Mouton de Gruyter, Berlin.
- Choi, H., 2001. Phrase structure, information structure, and resolution of mismatch. In Sells, P. (Ed.), *Formal and Empirical Issues in Optimality Theoretic Syntax*. CSLI, Stanford, CA, pp. 17-62.
- Chomsky, N., 1970. Remarks on nominalization. In Jacobs, R.A. and Rosenbaum, P.S. (Eds.), *Readings in English Transformational Grammar*. Ginn and Company, Waltham, MA, pp. 184-221.

- Copetake, A. and Briscoe, T., 1995. Semi-productive polysemy and sense extension. *Journal of Semantics* 12, 15-67.
- Deane, P. 1987. *English Possessives, Topicality, and the Silverstein Hierarchy*. BLS 13. Berkeley, California, Berkeley Linguistic Society.
- Doron, E. and Rappaport Hovav, M., 1991. Affectedness and externalization. *NELS* 21. GLSA, Amherst, pp. 81-94.
- Francis, W.N. and Kučera, H., 1982. *Frequency Analysis of English Usage*. Houghton Mifflin, New York.
- Garretson, G., Skarabela, B., and O'Connor, C., 2002. Mapping out the English possessive: Using corpora to differentiate the senses of 'of'. Poster presented at ICAME 2002, *The Theory and Use of English Language Corpora*. Göteborg, Sweden.
- Giorgi, A. and Longobardi, G., 1991. *The Syntax of Noun Phrases*. Cambridge University Press, Cambridge.
- Grimshaw, J., 1990. *Argument Structure*. MIT Press, Cambridge, MA.
- Grimshaw, J., 1997. Projection, Heads, and Optimality. *Linguistic Inquiry* 28, 373-422.
- Hawkins, R., 1981. Towards an account of the possessive constructions: *NP's N* and *the N of NP*. *Journal of Linguistics* 17, 247-269.
- Hendriks, P. and de Hoop, H., 2001. Optimality Theoretic semantics. *Linguistics and Philosophy* 24, 1-32.
- de Hoop, H. and de Swart, H., 2000. Temporal adjunct clauses in Optimality Theory. *Rivista di Linguistica* 12, 107-127.
- Jackendoff, R., 1968. Possessives in English. In Anderson, S.R., Jackendoff, R.S., and Keyser, S.J. (Eds.), *Studies in Transformational Grammar and Related Topics*. Brandeis University, Department of English, Waltham, MA, pp. 25-51.
- Jensen, P.A. and Vikner, C., 2002. The English pronominal genitive and lexical semantics. Paper presented at the Workshop on the Semantics/Syntax of Possessive Constructions, University of Massachusetts, Amherst.
- Jespersen, O., 1940. *A Modern English Grammar on Historical Principles, Part V*. Ejnar Munksgaard, Copenhagen.
- Jespersen, O., 1949. *A Modern English Grammar on Historical Principles, Part VII*. Ejnar Munksgaard, Copenhagen.
- Karlsson, F., Voutilainen, A., Heikkilä, J., and Anttila, A. (Eds.), 1995. *Constraint Grammar: A Language-Independent System for Parsing Running Text*. Mouton de Gruyter, Berlin.
- Kayne, R., 1984. *Connectedness and Binary Branching*. Foris: Dordrecht.
- Kiparsky, P., 1982. Word-formation and the lexicon. In Ingeman F. (Ed.), *Proceedings of the 1982 Mid-America Linguistic Conference*.
- Koopman, H. and Sportiche, D., 1991. The Position of Subjects. *Lingua* 85, 211-256.
- Lee, H., 2001. Markedness and word order freezing. In Sells, P. (Ed.), *Formal and Empirical Issues in Optimality Theoretic Syntax*. CSLI, Stanford, CA.
- Lees, R., 1960. *The Grammar of English Nominalizations*. Mouton, The Hague.
- Legendre, G., 2001. An introduction to Optimality Theory in syntax. In Legendre, G., Grimshaw, J., and Vikner S. (Eds.), *Optimality-Theoretic Syntax*. MIT Press, Cambridge, MA.
- Legendre, G., Raymond, W., and Smolensky, P., 1993. An Optimality-Theoretic typology of case and grammatical voice systems. BLS 19. Berkeley Linguistic Society, Berkeley, CA.
- Levin, B., 1993. *English Verb Classes and Alternations*. University of Chicago Press, Chicago.

- Maling, J., 2001. Dative: The heterogeneity of the mapping among morphological case, grammatical functions, and thematic roles. *Lingua* 111, 419-464.
- McCarthy, J.J., 2002. *A Thematic Guide to Optimality Theory*. Cambridge University Press, Malden, MA.
- Müller, G., 1999. Optionality in Optimality-Theoretic syntax. *Glott International* 4.5, 3-8.
- O'Connor, M.C., 1999a. Harmonic alignment of the animacy hierarchy and the structure of possessive DPs in Northern Pomo. Paper presented at the Workshop on Native American Languages, LFG 99. University of Manchester.
- O'Connor, M.C., 1999b. An Optimality Theory account of possessive DPs in Northern Pomo. Paper presented at the Joint meeting of the NSF-funded Optimal Typology projects at Stanford University and U.C. Santa Cruz.
- Pelletier, F.J. and Schubert, L.K., 1989. Mass expressions. In Gabbay, D. and Guenther, F. (Eds.), *Handbook of Philosophical Logic, Vol. IV, Topics in the Philosophy of Language*. Reidel, Dordrecht.
- Pesetsky, D., 1995. *Zero Syntax: Experiencers and Cascades*. MIT Press, Cambridge, MA.
- Prince, A. and Smolensky, P., 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. Rutgers University, New Brunswick, and University of Colorado, Boulder.
- Pustejovsky, J., 1995. *The Generative Lexicon*. MIT Press, Cambridge, MA.
- Roeper, T., 1993. Explicit syntax in the lexicon: The representation of nominalizations. In Pustejovsky, J. (Ed.), *Semantics and the Lexicon*. Kluwer, Dordrecht, pp. 185-222.
- Rosenbach, A., to appear. Aspects of iconicity and economy in the choice between the *s*-genitive and the *of*-genitive in English. In: Rohdenburg, G. and Mondorf, B. (Eds.), *Determinants of Grammatical Variation in English*. Mouton de Gruyter, Berlin/New York.
- Taylor, J.R., 1996. *Possessives in English*. Oxford University Press, Oxford.
- Tesar, B. and Smolensky, P., 2000. *Learnability in Optimality Theory*. MIT Press, Cambridge, MA.
- Uszkoreit, H., 1984. *Word Order and Constituent Structure in German*. PhD Thesis, University of Texas at Austin.
- Wasow, T., 1997. Remarks on grammatical weight. *Language Variation and Change* 9, 81-105.
- Weerman, F. and de Wit, P., 1999. The decline of the genitive in Dutch. *Linguistics* 37, 1155-1192.
- Williams, E., 1981. Argument structure and morphology. *Linguistic Review* 1, 81-114.
- Woisetschlaeger, E., 1983. On the question of definiteness in 'An old man's book'. *Linguistic Inquiry* 14, 137-154.
- Zeevat, H., 2000. The asymmetry of optimality theoretic syntax and semantics. *Journal of Semantics* 17, 243-262.