Nominal Structure & Interpretation

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The 1980s saw two independent, roughly contemporaneous developments in linguistic theory. Both were <u>enormously</u> influential:

- **Generalized Quantifier Theory (GQT)** in semantics (Barwise and Cooper 1981, Keenan and Stavi 1983, among many others)
- **DP Hypothesis (DPH)** in syntax (Abney 1987, Fukui and Speas 1986, Szabolcsi 1983)

GQT ⇒ quantifier types, cross-linguistic universals in D semantics, quantification outside the determiner system, indefinites & donkey anaphora
DPH ⇒ syntax of nominals, nature of functional categories, cartography

My own connections/interests:

- Biographical. I was Cooper's PhD student; Abney was my PhD student. I had a front row seat at these developments.
- Conceptual. GQT and DPH remain unintegrated lines of research; DPH views D as a **functional element** analogous to I/T; GQT views D as a **predicate** with arg structure analogous to V. The consequences for projection are substantial.

This afternoon:

- Review the development of "DP as Functional Cat" view.
- Introduce GQT and an alternative picture under which DP projects like VP.
- Note challenges arising for it under modern neo-Davidsonian approaches to semantics.

1.0 DP as Functional Cat

1.1 Early Period: The Primacy of S

Early generative grammar (Lees 1960, Chomsky 1964, Fraser 1970, Newmeyer 1970) noted systematic connections between clauses and other phrases – especially nominals. (1a,b) exhibit similar **grammatical/predicational relations**: it's natural to describe *the teacher* as the subject, of which *criticize*/*criticism* is predicated. *The student* likewise seems to be an object/complement of *criticize*/*criticism*.

(1) a. The teacher criticized the student.
b. The teacher's criticism of the student (was unjustified.)

Selectional relations also appear to match; (2a,b) seem anomalous for the same reasons.

(2) a. #The elephant severely criticized the stone.
    b. #The elephant's criticism of the stone (was severe.)

Transformational relations also seem relevant in the description of both. (3a,b) were taken to be related by a rule of Passive. (3b,c) appear similarly related.

(3) a. Mary rejected John.
    b. John was rejected by Mary.
    c. Mary's rejection of John (was painful.)
    d. John's rejection by Mary (was painful.)

In early generative grammar:

- **Sentences** are the unique domain where grammatical/predicational/ selectional relations are expressed
- **Sentences** are the unique domain of transforms (i.e., they apply only to Ss)
- All systematic relationships are to be captured by transformational rules.

These assumptions virtually mandate a **Nominalization Transform** deriving (1b) from (1a), e.g., from (4) through a rule acting as in (5) (Jacobsen 1976):

(4)

S1

Det - N - S2 - VP

The teacher criticize the student

(5) **Nominalization**
    a. raise the subject of S2 (*the teacher*) to Det, inserting *'s*
    b. insert -*ism*, converting V (*criticize*) to N (*criticism*).
    c. adjoin *of* to the object
    d. raise embedded VP (*criticism of the student*) to N, recategorizing it.

On this view, grammatical/predicational/selectional relations in nominals are <u>inherited</u> from their S-sources. Transformational relatedness is captured via timing wrt Nominalization (6):

(6)

	(3a)	⇒ ***Passive*** ⇒	(3b)	
Nominalization	⇓		⇓	***Nominalization***
	(3c)		(3d)	

1.2 *Remarks on Nominalization*: Generalizing Predication/Selection/Rules

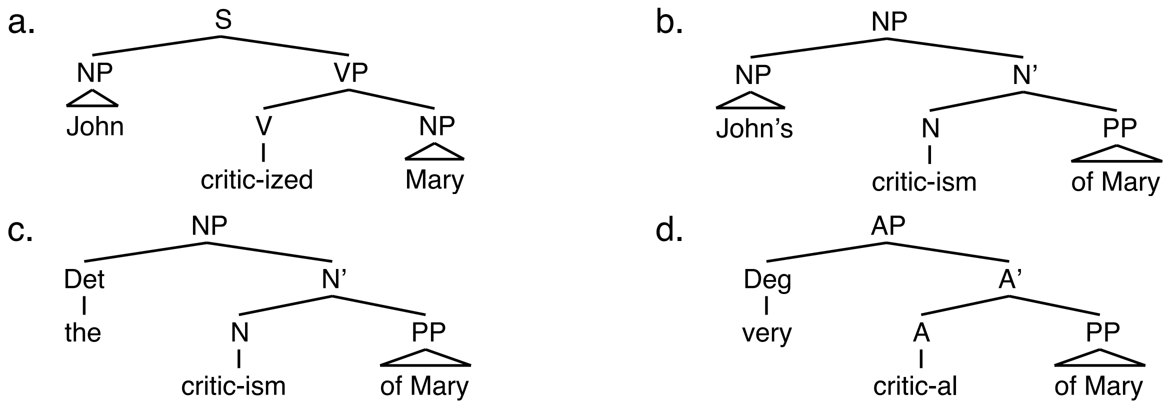
Chomsky (1970) reanalyzed nominalizations, proposing a three-fold generalization:

- a generalization of predicational/grammatical relations in syntax
- a generalization of the notion of selectional structure in the lexicon
- a generalization of transformational rules

Proposal 1. Predicational/grammatical relations are not the domain of a single expression type (S), so their presence is not diagnostic for transformational derivation from S. Predicational/grammatical relations can be captured in terms of an abstract structural template: "X-bar theory" (7).

(7) a. X" → Spec X'
b. X' → X Comp

Proposal 2. Roots underlying Vs and nominalizations are "category neutral". E.g., there is a single root *critic*-, with a single set of semantic selectional features, and disjunctive category features ([+n] v [+v]). This allows four mutually underived projections (8a-d):

(8)


Proposal 3. Classical grammatical transforms like Passive are not unitary; they can be decomposed into "sub-operations":

(9) a. John criticized Mary ⇓
b. ____ criticized Mary **by John** ***Agent Postposing***
⇓
c. **Mary** criticized ___ by John ***Object Preposing***
d. Mary was criticized by John.

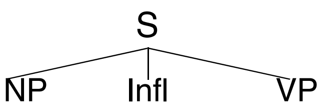
Transforms should apply freely to any structure meeting their structural description.

(10) a. John's criticism of Mary ⇓
b. ____ criticism of Mary **by John** ***Agent Postposing*** ⇓
c. The criticism of Mary by John ⇓
d. **Mary's** criticism ____ by John ***Object Preposing***
e. Mary's criticism by John

Upshot: Grammatical/predicational/transformational relations are no longer the exclusive domain of S and its core V. We now have a family of **lexical categories** (V, N, A) over which these relations are defined.

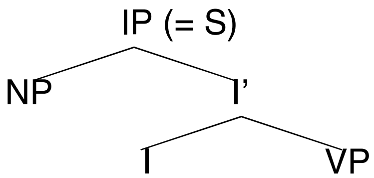
1.4 *Barriers*: Generalizing X' Projection

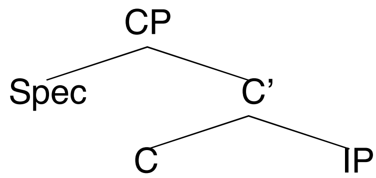
(8a-d) contain an anomaly: S itself fails to reflect X-bar theory. Over time, things only got murkier. Chomsky (1981) proposed an I(nfl) node between NP and VP (11):

(11)


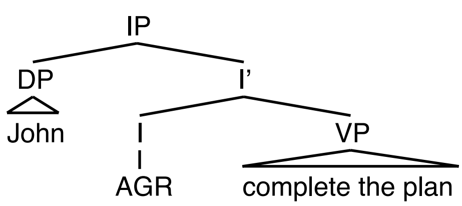
Non-lexical Categories. Infl marked a wider unclarity. *Remarks* extended X-bar theory to V, N, A and P, but was silent about "non-lexical categories" (Aux/Infl, Det, C, Deg, Int, Q, M, etc.) What governs <u>their</u> occurrence in structure??

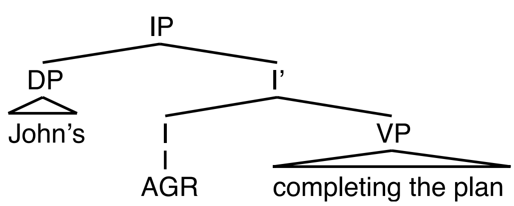
I & C as Heads. Chomsky (1986) proposes that I(nfl) and C project under X-bar theory just like lexical heads.

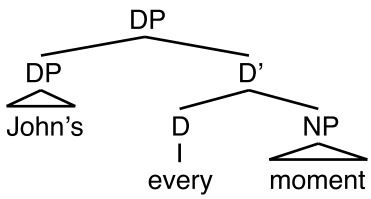
(12) a.


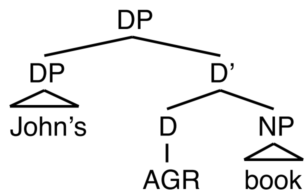
b.


Abney (1987) extended this idea to D (13):

(13) a.


b.


c.


d.


At this point a fundamental question arises:

- X-bar theory was originally offered as a generalized template for predicational/ grammatical relations – for syntax rooted in argument structure.
- Is projection of non-lexical categories understandable in these terms?

Abney (1987): “NO”! Abney separates Cs, Is, Ds, Degs, etc. as a special class of **functional elements**, identified as:

> closed class, phonologically/morphologically dependent, permitting only one complement, inseparable from complement,…., lacking “descriptive content”

Abney: ”The final characteristic...is in some sense the crucial characteristic.” Functional elements are fundamentally words without argument structure.

This move leads to “The Great Divorce”: sharp separation of syntactic composition for functional vs. lexical heads; cf. Grimshaw’s (1991) “extended projections”

(14) a. $[_{CP}\ [_{C'}\ C\ \ [_{TP}\ [_{T'}\ T\ \ [_{NegP}\ [_{Neg'}\ Neg\ \ [_{AsP}\ [_{Asp'}\ Asp$ **$[_{vP}$ SUBJ $[_{v'}$ v $[_{VP}$ V OBJ]]]]]]]]]]]**
b. $[_{DP}\ [_{D'}\ D\ \ [_{NumP}\ [_{Num'}\ Num$ **$[_{nP}$ SUBJ $[_{n'}$ n $[_{NP}$ N OBJ]]]]]]]**

“Functional Scaffold” “Lexical Core”

(Apparent) Conclusions:

- Lexical categories represent **the limit** to which notions of grammatical/ predicational/selectional/thematic/argumental relations extend.
- Beyond V, N, A (and P?) these notions simply don’t make sense, and so cannot be the basis for syntactic projection.

Is that really true?

2.0 The Road Not Taken: Generalized Quantifier Theory

2.1 The Relational View of Determiners (RVD)

Relational View of Determiners: Ds express relations among predicate meanings.

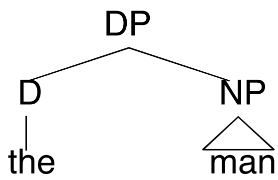
(15) a. ALL(’whalehood’,’mammalhood’) (cf. *All whales are mammals*)
b. SOME(’man’,’arrive’)

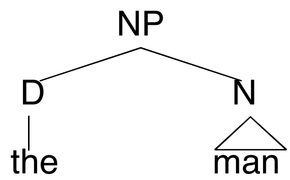
(16) a. *whale* ⇒ {x: x is a whale} b. *mammal* ⇒ {x: x is a mammal}
c. *man* ⇒ {x: x is a man} d. *arrive* ⇒ {x: x arrives}

(17) a. ALL(X,Y) iff $| Y - X | = 0$
b. SOME(X,Y) iff $| Y \cap X |$ 0

(18) a. NO(X,Y) iff $| Y \cap X | = 0$
b. MOST(X,Y) iff $| Y \cap X | > | Y - X |$
c. TWO(X,Y) iff $| Y \cap X | = 2$ (similarly for other numeral Ds)
d. THE-TWO(X,Y) iff $| Y \cap X | = 0$, where $| Y | = 2$ (similarly for other Ds of the form *the*-n)
e BOTH(X,Y) iff THE-TWO(X,Y)
f. NEITHER(X,Y) iff $| Y - X | = 0$, where $|Y| = 2$
g. THE(X,Y) iff THE-ONE(X,Y)

RVD appears more compatible with the DP-view of nominals (19a) than with the traditional NP-view (19b). Under RVD, D-selects NP as an argument.

(19) a.


b.


<u>BUT</u>, RVD is plainly <u>in</u>compatible with the claim that Ds denote items without argument structure. The general notion of valence seems fully applicable to D.

2.1.1 Valence in D

Monotransitive Ds. Typical Ds like *all, some, no, most*, etc. relate <u>two</u> set args – one given by NP and one given by VP. These are the D counterparts of monotransitive Vs:

(20) a. every <u>fish</u> <u>swims</u>
EVERY(X , Y)

b. <u>Mary</u> kissed <u>John</u>
KISS(x , y)

Ditransitive Ds. *Every-except* in (21) relates <u>three</u> set args: one given by NP (*man*), one given by VP (*smoke*) and one given by the object of *except* (*Bill and James*):

(21) a. Every man except Bill and James smokes
b. $|(\{x: man(x)\} - \{Bill,James\}) - \{x: smokes(x)\}| = 0$ &
$|\{Bill,James\}) \cap \{x: smokes(x)\}| = 0$
c. EVERY-EXCEPT(X,Y,Z) iff $|(Y - Z) - X| = 0$ & $|X \cap Z| = 0$

Similarly, *more, fewer, as many, as few,* etc. seem to relate three sets: one given by NP (*men*), one given by VP (*smoke*) and one given by *than*/*as* (*women*).

(22) a. More men than women smoke
b. $|\{x: \text{man}(x)\} \cap \{x: \text{smokes}(x)\}| > |\{x: \text{woman}(x)\} \cap \{x: \text{smokes}(x)\}|$
c. MORE-THAN(X,Y,Z) iff $|Y \cap Z| > |X \cap Z|$

(23) a. As many men as women smoke
b. $|\{x: \text{man}(x)\} \cap \{x: \text{smokes}(x)\}| \geq |\{x: \text{woman}(x)\} \cap \{x: \text{smokes}(x)\}|$
c. AS-MANY-AS(X,Y,Z) iff $|Y \cap Z| \geq |X \cap Z|$

These appear to be the D counterparts of ditransitive Vs:

(24) a. every man except Bill and James smokes

EVERY-EXCEPT(X , Y, Z)

b. Mary gave John Fido

GIVE(x, y, z)

Intransitive Ds Pronouns (under an assignment function g) select a single set arg: the set of which the individual in question is a member (25).

(25) $\text{HE}_n(X)$ iff $g(n) \in X$

Pronouns are the D counterparts of intransitive Vs (Postal 1970):

(26) a. He_n swims

HE_n (X)

b. Mary laughed

LAUGH(x)

2.1.2 θ-roles in D

Set arguments of D play different parts in quantification (cf. 27a,b). The NP gives the domain of quantification – the **restriction**. VP says what's true of elements from the domain – the **scope.** 1st order formulae (27c) and do not capture this, representing NP & VP contributions symmetrically (cf. 28):

(27) a. Some [man] [runs].
b. Some [runner] [is a man].
c, $\exists x[\text{man}(x) \; \& \; \text{runs}(x)] = \exists x[\text{runs}(x) \; \& \; \text{man}(x)]$

(28) a. Some [men] [are bachelors].
b. Some [bachelors] [are men].

Larson (1991): Restriction and scope should be thought of as **θ-roles - θ_{SCOPE} θ_{RESTR} - assigned by D** (29a). With ditransitives, there is a third, "oblique" role (θ_{NOBL}) assigned to complements of *except/than/as* (29b).

(29) a. $\quad\quad\quad\quad\theta_{SCOPE}\ \ \theta_{RESTR}$ $\quad\quad\quad\quad\quad\quad\quad\quad\theta_{AGENT}\ \ \theta_{THEME}$
EVERY(X , Y) KISS(x , y)

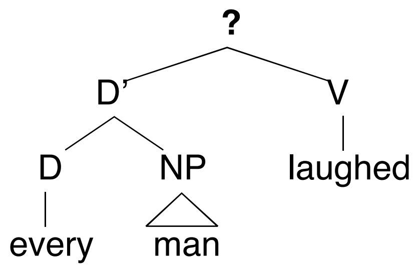
b. $\quad\quad\quad\quad\theta_{SCOPE}\ \ \theta_{RESTR}\ \ \theta_{NOBL}$ $\quad\quad\quad\theta_{AGENT}\ \theta_{THEME}\ \theta_{GOAL}$
EVERY-EXCEPT(X , Y , Z) GIVE(x , y , z)

2.2 Projecting DP

2.2.1 A Selectional Paradox?

Selecting heads are assumed to project their category. If so, RVD seems to induce a paradox. What is the category label "?" in (30):

(30)



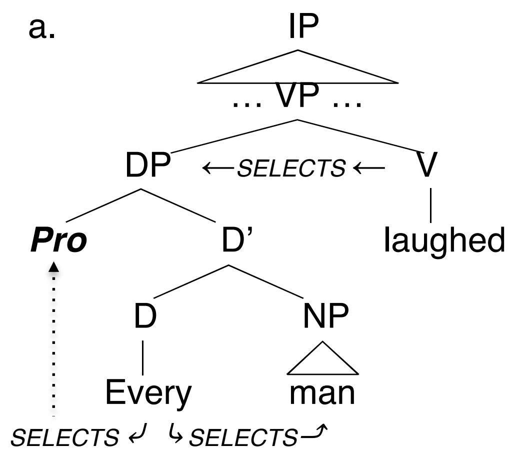
Under standard views, V (or v) selects *every man*. Hence ? = VP
Under RVD, D selects *man* and *laughed*. Hence ? = DP

(31) a. John persuaded **Mary** to attend.
Mary = obj of *persuade* AND subj of *attend*

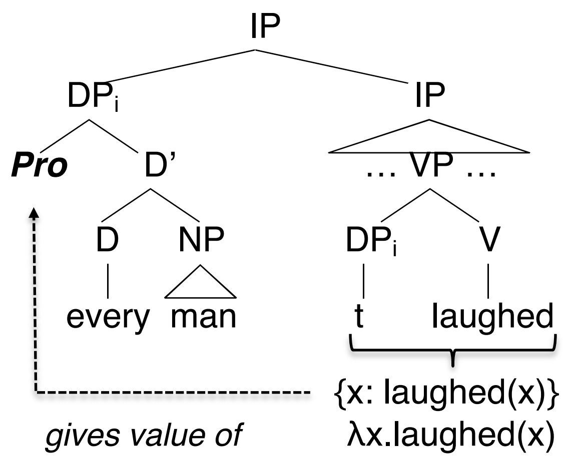
b. John persuaded Mary [**PRO** to attend].
gives value of

Proposal: D never selects its scope arg directly. DP contains an internal subject *Pro*, whose value is given by the predicate to which DP adjoins at LF:

(32) a.



b.

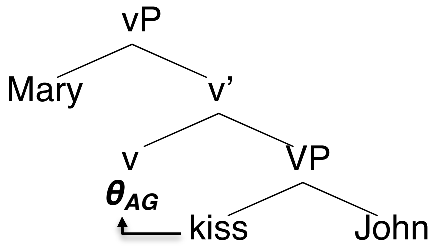


2.2.2 Projecting Transitive, Ditransitive and Intransitive DPs

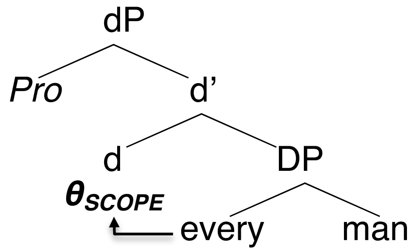
Larson (forthcoming) shows that, with this much in place, Ds can be projected in exact parallel with Vs.

(33) **Monotransitive Vs/Ds**

a.

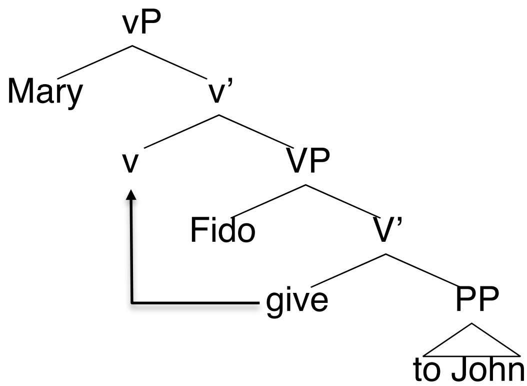


b.

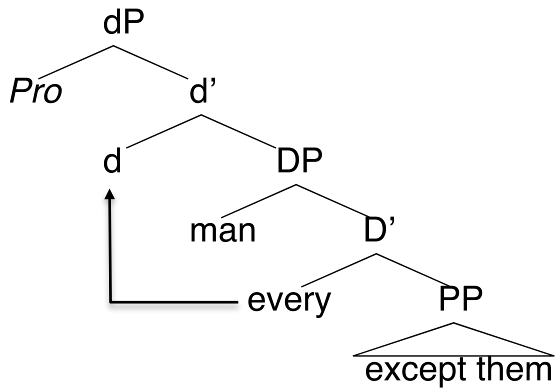


(34) **Ditransitive Vs/Ds**

a.

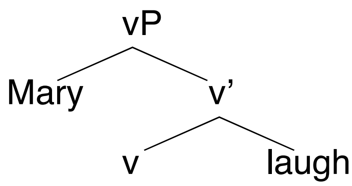


b.

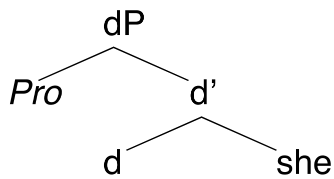


(35) **Intransitive (Unergative) Vs/Ds**

a.



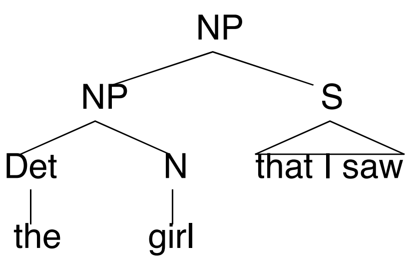
b.



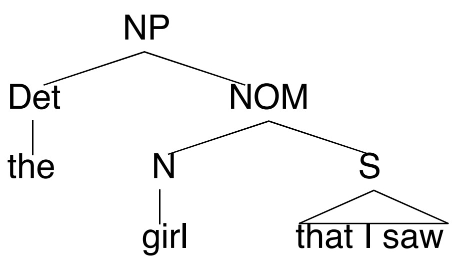
2.2.3 Projecting Modifiers

DP and VP parallelism suggests a way of reviving old (but appealing) views of modifier attachment.

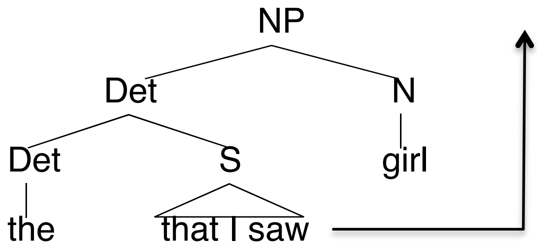
(36) a. ***The NP-S Analysis***
Ross (1967)



b. ***The NOM-S Analysis***
Stockwell, Schacter & Partee (1970)



c. ***The ARTICLE-S Analysis*** Smith (1964)

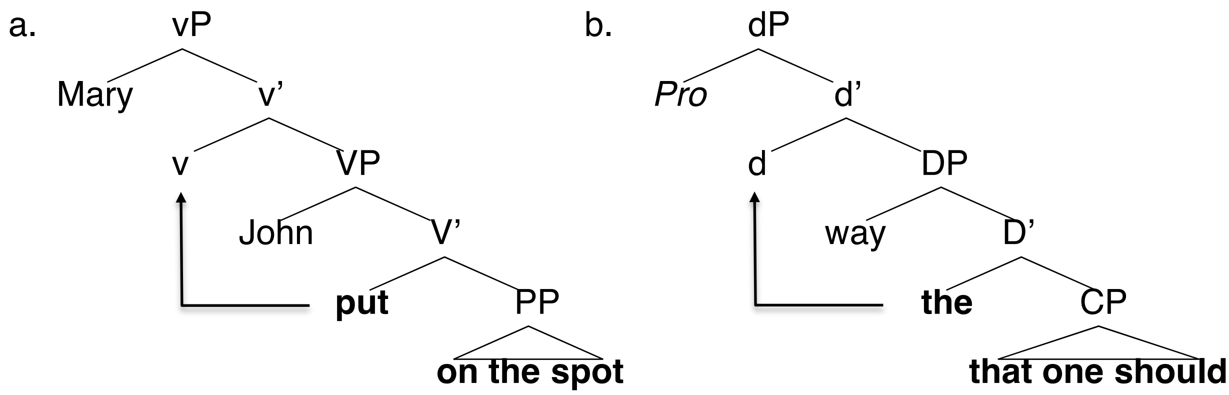


Article-S is suggested by apparent discontinuous dependencies between D and restrictive mods, including RCs:

(37) a. I earned it { that way
b. *the way
c. the way that one should
(after Kuroda 1968)

(38) a. that Paris
b. *the Paris
c. the Paris that I love
(after Jackendoff 1977)

(39) a. [$_{VP}$ **treat** John **with kid gloves**] ("treat carefully") MANNER
b. [$_{VP}$ **rub** John **the wrong way**] ("bother") MANNER
c. [$_{VP}$ **put** John **on the spot**] ("confront") LOCATION
d. [$_{VP}$ **kill** John **with kindness**] ("be very solicitous toward") INSTRUMENT

(40)


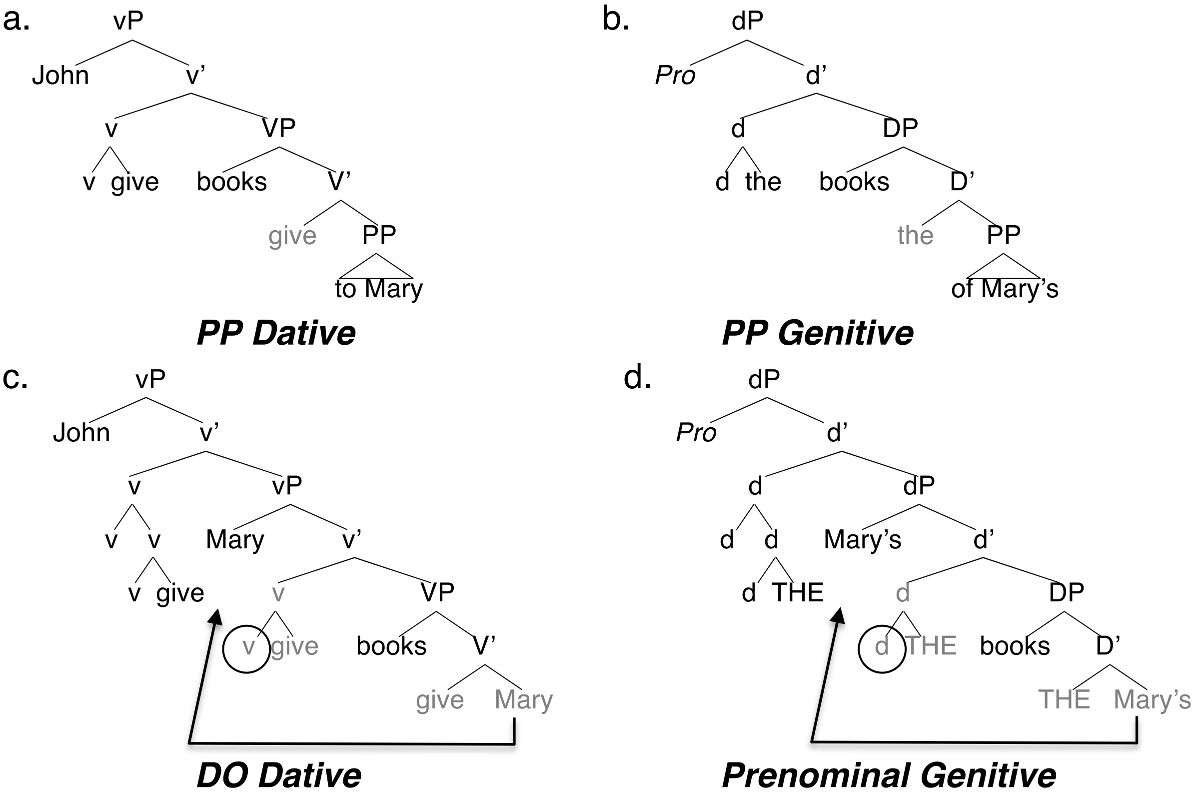
2.2.4 Projecting Genitives

Parallelism between ditransitive V and D also yields a surprising view of PP and prenominal genitives, viz., as the counterparts of PP and DO datives (resp.).

(41) a. GIVE(x, y, **z**)
b. POSS(X, Y, **z**) iff THE-ONE(X, (Y ∩ {x: R(**z**, x}))
c. John gave books to Mary ⇔ The books of Mary's
d. John gave Mary books ⇔ Mary's books

Larson (forthcoming) offers a parallel account of projection & derivation for the two:

(42)



v = d = applicative heads (Marantz 1993)

Conclusion:

- Lexical categories do **not** represent the limit to which notions of grammatical/ predicational/selectional/thematic/argumental relations extend.
- They merely represent the limit to which **V-derived** versions of these concepts extend (individuals as args, roles like θ_{AGENT}, θ_{THEME}, etc.).
- Quantifiers (including Ds, Degs, Ms) involve a different argument type (sets) and different θ-roles (θ_{SCOPE}, θ_{RESTR}).
- Once these differences are accommodated, syntactic projection/derivation can proceed as usual.

3.0 Quantifier Separation

Verbal θ-roles have changed status in semantic theory: from purely descriptive terms (43b) (Gruber/Jackendoff) to elements of semantic analysis (43c) (Davidson 1967; Casteneda 1967; Parsons 1990). This is **Argument Separation**.

(43) a. John gave Fido to Mary.
"AGENT" "THEME" "GOAL"

b. GIVE(John , Fido , Mary)

c. GIVE(e) & **AGENT**(e, John) & **THEME**(e, Fido) & **GOAL**(e, Mary)

Separation has proven highly productive in the analysis of verbal semantics. But it poses a severe challenge for V/D parallelism:

(44) a. Every fish swims.

"SCOPE" "RESTRICTION"

b. EVERY({x: swim(x)} , {y: fish(y)})

c. **EVERY**(e) & **SCOPE**(e, {x: swim(x)}) & **RESTRICT**(e, {y: fish(y)}) **???**

Questions:

- (43c) distinguishes the act of giving (GIVE(e)) from its participant individuals. Is it sensible to think of separating a quantificational state (EVERY(e)) from its participant sets?

  Surely if anything would seem to represent a pure relation between individuals, it's a Q-relation, which simply evaluates cardinalities, proportions, etc. of sets of individuals.

- (43c) requires us to make sense of AGENT(e, x), THEME(e, x) and GOAL(e, x). (44c) requires us to make sense of SCOPE(e, X) and RESTRICT(e, X).

  The first task seems far more tractable; e.g., we have Ps to guide us: AGENT means (roughly) what *by* means; GOAL means what *to* means, etc. Nothing comparable seems available with SCOPE and RESTRICT. How are we to think of such relations?

3.1 Quantificational States

3.1.1 Verbalizing Quantification

(44c) involves (in essence) "verbalizing" quantificational relations. It's worth noting that some Vs come very close to expressing such relations on their own:

(45) a. John is **tall-er** than Bill.

b. John **exceeds/surpasses** Bill **in height**.

c. John is **as tall** as Bill.

d. John **equals** Bill **in height**.

3.1.2 Causing Quantificational States

If causation is analyzed as a relation between eventualities (45) (Davidson 1967), reference to Q-states seems unavoidable.

(45) CAUSE(e , e')

(46) a. John's sneezing made Mary leave.
b. John's sneezing ⇒ ∃! e[SNEEZE(e) & **AGENT**(e, John)]
c. Mary leave ⇒ ∃e' [LEAVE(e') & **AGENT**(e, Mary)]
d. John's sneezing made Mary leave ⇒ ∃!e∃e'[SNEEZE(e) & AGENT(e, John) & **CAUSE**(e,e') & LEAVE(e') & AGENT(e', Mary)]

Now compare (47-48), from Johnston (1994):

(47) a. Leopold always robs a bank because he needs money fast.
b. Frankie always misses the bus because he is a slow runner.

(48) John always sold shares because he needed the money. (Johnston 1994).
a. 'Each event of John's selling shares was caused by a state of John's needing money'
b. 'John's need for money caused a certain behavioral pattern, viz.: John's always selling shares.'

In (46a)/(47a)/(48a) individual events cause other individual events. But in (47b) and (48b), a state causes a "quantificational pattern". Consider also:

(49) [a dog's biting him in childhood] made
[John always become nervous whenever a dog was near him].

Always binds all events variables in its scope; hence without a state corresponding to *always* itself, there will be no second event for **CAUSE** to relate to (50). We need something like (51):

(50) ∃! e [a dog's biting John (e)] & **CAUSE**(e , ??)
ALWAYS({e": John become nervous(e")} , {e*: a dog near John (e*)})

(51) ∃!e ∃e' [[a dog's biting John (e)] & **CAUSE**(e , **e'**) & ⬇
ALWAYS({e": John become nervous(e")} , {e*: a dog near John (e*)} , **e'**)

3.2 Quantificational θ-roles

The argument above supports Q-states, but does not entail arg-separation. One could move from (52a) to (52b), without going all the way to (52c). Nonetheless, the parallel move for V is widely assumed (54a-c). How do we think about this?

(53) a. **ALWAYS**(X , Y)
b. **ALWAYS**(X , Y, **e**)
c. **ALWAYS**(**e**) & θ_1(e, X) & θ_2(e, Y)

(54) a. **kick**(x, y)
b. **kick**(x, y, **e**)
c. **kick**(**e**) & θ_1(e, x) & θ_2(e, y)

3.2.1 A Temptation

It's tempting to look to verbal constructions like (56a) in attempting to "neo-Davidsonianize" quantification:

(55) a. This set of choices **exhausts/subsumes/includes** our range of options.
b. $\{x: \text{option}(x)\} \subseteq \{x: \text{choice}(x)\}$
c. **EVERY**(X,Y) iff $Y \subseteq X$ (i.e., iff $|Y - X| = 0$)

(56) $\exists e$ [**exhaust/subsume/include**(e) & $\theta_1(e, X)$ & $\theta_2(e, Y)$]

This would appeal to a primitive, verbalized counterpart of the subset relation to explicate universal quantification. But**:**

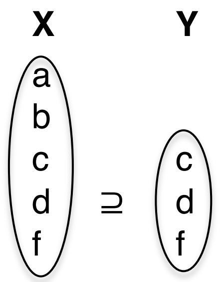
(57) $A \subseteq B \equiv_{def} \forall x[\, x \in A \rightarrow x \in B]$'

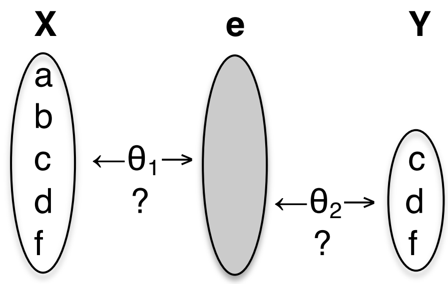
How can the subset relation explicate universal quantification when subset is itself <u>defined</u> in terms of universal quantification?

3.2.2 Quantizing e

Neo-Davidsonian representation (53c) separates the individuals (X,Y) involved in quantification, relating them to e but not to each other. How can we capture the equivalent of (57) – how can we relate the two in the way quantification requires?

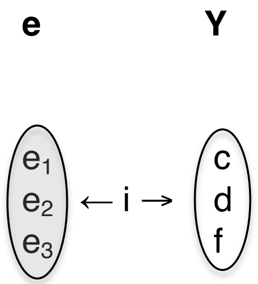
(58) a. **EVERY**(X , Y) c. **EVERY**$(\mathbf{e})$ & $\theta_1(e, X)$ & $\theta_2(e, Y)$

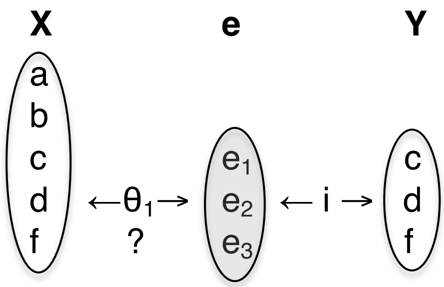
c.


d.


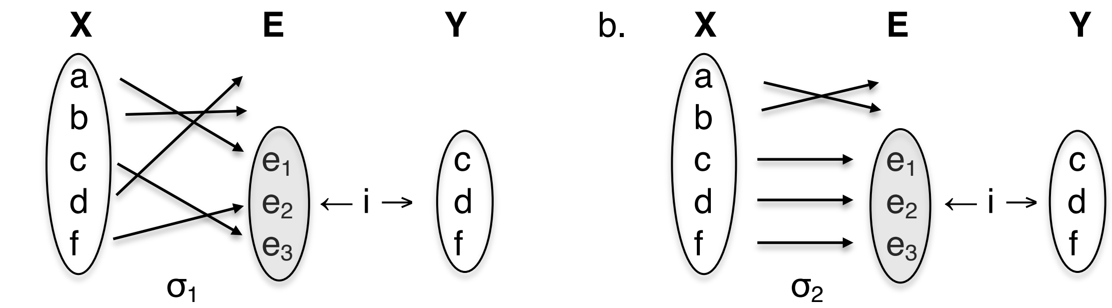
Tentative proposal: X and Y are related via the **structure of e**.

(59) $\theta_2(e, Y)$ iff $\exists$ i an isomorphism from Y to e.

(60) a.


b.


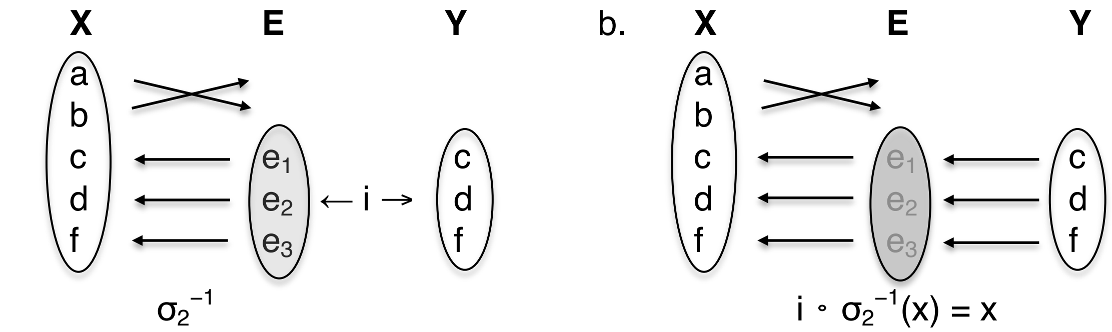
(61)



Surjections σ from X to e (i.e., homomorphisms from X to E that "cover" e)

Note that iff Y ⊆ X, there will a surjection σ from X to e whose **right inverse** σ^{-1}, when composed with i, is the identity function:

(62)



(63) $\theta_\forall$(e, X) iff ∃ σ a surjection from X to e such that i ∘ σ_2^{-1} is the identity function.

Under this picture:

- **RESTRICT** "injects" the structure of ⟦NP⟧ into e, the Q-state.
  (i.e., the Q-state = the states of those individuals)
- Individual quantifiers represent θ-relations of ⟦*Pro*⟧ to e.

(64) ∃e [θ_{QUANT}(e, ⟦*Pro*⟧) & **RESTRICT**(e, ⟦NP⟧)]

Why on earth go to this trouble to Davisonianize Qs? Is this more than hackery?

Perhaps, yes.

- Krifka (1998;1999) offers an analysis of telicity in which the theme of a telic predicate is homomorphically injected into the verbal event. Boundness/ unboundedness in the former yields boundness/unboundedness in the latter. **RESTRICT** looks equivalent to Krifka's incremental theme relation.
- Davidson (1967) argues that all sentences are event quantificational at heart. It would thus not be surprising to find that the event analysis of quantifiers underlies the event analysis of familiar, verbal predication.

4.0 Summary

- Early TG took grammatical, predicational, selectional & transformational relations to be solely the domain of S/V.
- The 70s extended this domain from S/V to all lexical cats (V, N, A, P).
- Roots = the locus of arg structure/selection; X-bar = a template for grammatical/ predicational relations; transforms were decomposed/generalized.
- The 80s raised the question of non-lexical cats & their projection.
- Does X-bar theory apply to them too? Chomsky (1986): Yes!
- Do they have arg-structure? Abney (1987): No!
- "The Great Divorce" - Lexical vs. Functional Categories
- A different answer was/is available, at least for Q-elements.
- GQT/RVD yields a view of projection for Q-elements parallel to V elements, including parallel notions of valence, modifier syntax & voice alternation.
- These results extend to **all** quantificational elements – (e.g., Deg, Meas, etc.).
- New challenge: can we carry the (neo-)Davidsonian semantics of lexical cats into Q? Can we justify Q-states? Can we make sense of Arg-separation for Q?
- Tentative answer: Yes, Q-states seem justifiable. Yes, we can make sense of Arg-separation for Q under specific assumptions.
- Although history proceeded the other way, the resulting picture suggests the tantalizing possibility that quantificational θ-relations are actually more basic than verbal ones - that V is analogous to D, rather than the contrary.

Thank you!

References (Available on request)