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SoSe 2009
MM3 Cross-Linguistic Semantics
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2 – Composition and Argument Saturation

with special focus on EXISTENTIAL CLOSURE & PREDICATE RESTRICTION

1. Modes of Composition (Chung & Ladusaw 2004: ch.1):

1.1 Saturating MCs

i. Function Application (FA):

→ Presumably universal mechanism to combine functional, i.e. unsaturated elements (verbs, prepositions etc.), with their (individual-denoting) arguments

(1) a. [Audu [yaa ga [Musa]]]
Audu 3SG.PERF see Musa

b. Audu saw/sees Musa.

c. ⟦(1ab)⟧ = ⟦see/saw ⟧ (⟦Musa⟧) (⟦Audu⟧)
= [λyλx. x sees/saw y] (Musa) (Audu)
= [λx. x sees/saw Musa] (Audu)
= 1 iff Audu sees/saw Musa

→ FA saturates an argument position for good, unless the argument is a variable. In that case, the argument position can be 'opened up' again by lambda-or predicate abstraction, for instance in case of bound variables (Heim & Kratzer 1998: ch. 7):

(2) a. Every student$_i$ adores *herself$_i$*.

b. ∀x [student(x)]: x adores x

ii. Function Composition (FC) (Jacobson 1996, 1999): $\langle\sigma,\varphi\rangle \circ \langle\varphi,\tau\rangle = \langle\sigma,\tau\rangle$

→ Given appropriate types, FC can lead to saturation of an argument position, e.g. if a transitive verb combines with a quantified DP-argument: [V + DP$_Q$]

(3) a. <e, **et**> ○ <**et,** t> = <e, t> (3 open arguments → 1 open argument)

b. ⟦ saw every skunk ⟧ = ⟦ saw ⟧ ○ ⟦ every skunk ⟧
= ⟦ λyλx. x saw y ⟧ ○ ⟦ every skunk ⟧
= [λyλx. x saw y] ○ [λP. ∀z [skunk(z)]: P(z) ⟧
= λx. [λP. ∀z [skunk(z): P(z)] ([λy. x saw y⟧)
= λx. ∀z [skunk(z)]: x saw y

iii. Existential Closure (EC) (Chung & Ladusaw 2004):

→ EC saturates open argument positions by existentially quantifying over them.

(4) a. EC = $\lambda P \in D_{<\sigma,t>}. \exists x \in D_\sigma [P(x)]$

b. ⟦ there is a man ⟧ = $\lambda P \in D_{<e,t>}. \exists x \in D_e [P(x)]$ [man'] = $\exists x \in D_e$ [man'(x)]

c. ⟦ Brutus kissed Caesar⟧ = $\lambda P \in D_{<v,t>}. \exists e \in D_v [P(x)]$ [λe. Brutus kissed Caesar in e]
= $\exists e \in D_v$ [Brutus kissed Caesar in e]

→ EC = default mechanism for saturating event argument positions (Davidson 1967)

iv. *SPECIFY (via type shift & choice function), e.g. in Maori (Chung & Ladusaw 2004)*

→ Type Shift, e.g. by way of a choice function, can assimilate a potential argument of the appropriate type. It thus constitutes a pre-condition for argument saturation.

→ Choice functions turn property-denoting expressions P of **type <et>**, e.g. indefinite NPs, into individual-denoting expressions CF(P) of **type <e>**:

e.g. with specific indefinites:

(5) a. Muusaa **bà**-i kiraa *wani àbookii* lìyaafaa **ba** [Hausa, ZIM 2008]
Musa NEG-3sg.SUBJ invite some friend ceremony NEG
'There is some friend that Musa did not invite.'
(or 'Musa did not invite any friend.')

b. [[kiraa wani aboki]] = [λyλx. x invited y] (**CF**(λz. z is a friend))

= λx. x invited **CF**(λz. z is a friend)
<e>

1.2 Non-Saturating CMs

v. Predicate Modification (PM) (Heim & Kratzer1998: ch. 4):

→ PM combines the meaning of two property-denoting expressions <σ,t> by way of logical conjunction/set intersection (but see section 5 on asymmetric modification).

→ PM applies (universally?) in case of adnominal (attributive As, restrictive relative clauses, PP-modifiers) and adverbial modification (temporal/locative adjuncts)

(6) a. [[casa blanca]] = λz. [[white]](z) ∧ [[house]](z)

b. [[Peter am Mittwoch schwänzen]]

= λe. e ist am Mittwoch und e ist ein Schwänzen von Peter

→ The assumption of PM allows for a unified semantic treatment of attributive and predicative adjectives as being of type <et>:

(7) a. blaues Haus vs. b. das Haus ist blau
<et> <et> <e> <et>

vi. Function Composition II (Jacobson 1999):

→ Given appropriate types, FC can leave a semantic argument position unsaturated in spite of syntactic complementation: [V + pronoun]

(8) loves him → <e,et> + <e,e> → <e,et>

→ In Jacobson's framework, pronouns denote an identity function of type <e,e>. In effect, this means that the argument position remains open for modification/saturation at a later point in the derivation, obviating the need for predicate (= λ-) abstraction.

2. A Puzzle: Semantic Treatment of indefinite (object) NPs

2.1 Problems with the composition of indefinite object NPs:

i. On standard GQ-accounts, the semantic types of transitive verb <e<et>> and indefinite object DP (e.g. *a horse*) <<et,t> are incompatible.

ii. Many languages, if not most, have bare indefinite NPs that take obligatory narrow scope relative to other operators (negation, modals, quantifiers).

iii. In many cases, indefinite NPs do not seem to have a quantificational force of their own, but their interpretation depends on another quantifying element in the clause (*quantificational variability effects*, QVEs):

(9) **A Texan** always drinks beer. ≈ All Texans drink beer.

iv. In some languages (West Greenlandic, van Geenhoven 1998), such NPs are syntactically incorporated into the verb:

(10) Arnajaraq **aalisaga**-si-nngi-l-a-q. (Van Geenhoven, 1998: 31)
A.ABS fish-buy-NEG-IND-[-tr]-3SG

i. 'It is not the case that Arnajaraq bought (one or more) fish.'
ii. # 'There is/are (a) fish that Arnajaraq didn't buy.'

→ For those languages, it makes sense to assume a process in which the verbal predicate is restricted (= modified) by an indefinite NP with simultaneous saturation of the corresponding semantic argument position by existential closure:
RESTRICTION + SATURATION

→ van Geenhoven (1998) builds EC into the meaning of the ambiguous predicate *si* 'buy':

(11) a. $[\![si_2]\!] = \lambda P \in D_{<et>}.\lambda x \in D_e.\ \lambda e.\ \exists \mathbf{y}\ [P(\mathbf{y}) \wedge x \text{ bought } y \text{ in } e]$

b. $[\![\text{aalisaga+}si_2]\!] = \lambda x \in D_e.\ \lambda e.\ \exists \mathbf{y}\ [\text{fish'}(\mathbf{y}) \wedge x \text{ bought } y \text{ in } e]$

→ effectively, this is just an application of FA, leading to semantic saturation!

→ *Predicative indefinite incorporation* inevitably results in narrow scope for the indefinite

→ The same mechanism has been proposed for bare plural NPs in English (or German) (Carlson 1977), which always take narrow scope !

(12) a. I did not catch rabbits.

not: 'There are some rabbits that I did not catch

b. $[\![\text{catch}_{<e,et>}\ \text{rabbits}_{<et>}]\!] = \lambda x \in D_e.\ \lambda e.\ \exists \mathbf{y}\ [\text{rabbit'}(\mathbf{y}) \wedge x \text{ caught } y \text{ in } e]$

Q1: Is there cross-linguistic variation concerning which syntactic arguments can restrict the verbal predicate in this way: only objects → West Greenlandic, OR objects + subjects → Hausa?

(13) a. *manòomii* **bà**-i zoo **ba** [Hausa, ZIM 2008]
farmer NEG-3sg come NEG
'No farmer came.'

b. Farmers did not come.

Q2: Is there another way of achieving the semantic result in (11b), without assuming lexical ambiguity in the verb?

v. Other languages (e.g. Chadic, Maori) have two series of indefinite NPs:

- unspecific, existentially closed indefinites with obligatory narrow scope, which often occur as bare NPs, cf. (14a):

(14) a. mùtûm yaa ginà *gidaa*. [Hausa]
man 3sg.PERFbuild house
'The man built *a house*.'

b. $[\![\text{gina}_{<e,et>} \text{gida}_{<et>}]\!] = \lambda x \in D_e.\ \lambda e.\ \exists \mathbf{y}\ [\text{house'}(\mathbf{y}) \wedge x \text{ built } y \text{ in } e]$

- a special set of morphologically marked indefinites that can also take wide scope and can get a specific interpretation, see also the Hausa *wani*-NP in (5a):

(15) a. Kāore *tētahi tangata* i vaiata mai. [*Maori*, Chung & Ladusaw 2004]
T.not a person T sing to.here
'A (particular) person did not sing.'

b. Kāore *he tangata* I waiata mai.
T.not a person T sing to.here
'No one at all sang.' (but: *'A (particular) person did not sing.'

- *Conclusion*

i. The assumption of lexical ambiguity in the verb (van Geenhoven 1998) has nothing to say on the presence of two kinds of indefinite NPs in Hausa and Maori.

ii. Likewise, the standard 'generative' approach of indefinite NPs as generalized quantifiers (plus quantifier-raising) has nothing to say on the presence of two kinds of indefinite NPs in Hausa and Maori.

2.2 An alternative analysis of indefinite NPs: RESTRICTION + EXISTENTIAL CLOSURE

→ The existence of two kinds of indefinite expressions suggests that the different morphological markings indicate different composition procedures (Chung & Ladusaw 2004)

SPECIFY (type shift by choice-function), for marked NPs that can be specific and take wide scope vs.

RESTRICTION, for bare NPs with narrow scope, which leaves the argument position unsaturated and is followed by EC at a later step in the derivation, cf. (15bc).

(15) b. Kāore *he tangata* I waiata mai.
T.not a person T sing to.here

c. $[\![\text{he tangata I waiata}]\!] = [\lambda x \in D_e.\ \lambda e.\ x \text{ sang in } e] +_{\mathbf{REST}} [\lambda y.\ \text{person}(y)]$

$= \lambda x \in_e.\ \lambda e.\ \mathbf{person}(x) \wedge x \text{ sang in } e$ (RESTRICTION)

$\Downarrow$ + EC at the event level: vP

$\lambda e.\ \exists x\ [\mathbf{person}(x) \wedge x \text{ sang in } e]$

$\Downarrow$ + existential event closure below negation

d. $[\![\text{Kāore he tangata I waiata}]\!] = \neg \exists e\ \exists x\ [\mathbf{person}(x) \wedge x \text{ sang in } e]$

Q3: How is RESTRICTION formally defined?

→ Interpreting indefinite NPs by step-wise application of RESTRICTION and EC is essentially the approach of dynamic semantic frameworks, such as *file change semantics* (Heim 1982, see also Diesing) and *DRT* (Kamp 1981, Kamp & Reyle 1993).

3. A Historical Note on Indefinites and Existential Closure (Heim 1982, Diesing 1992)

→ a number of empirical differences between indefinite NPs and genuine quantifying DPs with *most/each/every* argue that indefinite NPs do not denote generalized quantifiers of type <<et>t>, as assumed by Montague (1973) and Barwise & Cooper (1981):

i. Unlike QPs, they can serve as antecedents for cross-sentential anaphora:

(16) a. **A man$_1$** entered the bar. **He$_1$** ordered a drink.

b. **Every/Each man$_1$** entered the bar. **#He$_1$** ordered a drink.

ii. Unlike QPs, they can be quantified over, e.g. in donkey sentences (see also (9)):

(17) a. If a man$_1$ loves a woman$_2$, he$_1$ buys her$_2$ flowers. (= any man, any woman)

b. If a man loves every woman$_2$, he buys her$_{3/*2}$ flowers.

- *A tentative universal*:

  Every natural language has indefinite NPs that (i.) serve to introduce new discourse referents, (ii.) allow for cross-sentential anaphora, (iii.) can be quantified over by other operators, e.g. in donkey sentences; if a language has bare and marked indefinites, these functions are taken over by the bare form.

→ the central semantic function of indefinite NPs is to introduce new discourse referents, in form of a variable, which is restricted by the property expressed by the lexical meaning of the NP.

→ indefinite NPs can be conceived of as property-denoting (type <et>) and their individual variable is bound later in the derivation by an independent process of existential closure, which binds any free variables in the scope of application

- *The locus of existential closure:*

i. Heim (1982): sentence-level & text level:

(18) a. $\exists x\ [_{IP} \ldots x \ldots]$

b. $\exists x\ [_{CP1}$ a man (x) $[_{CP2}$ (he)] (cross-sentential anaphora)

ii. Diesing (1992), Chung & Ladusaw (2004): at the syntactic level where the event is introduced, i.e. the left edge of vP/VP, right below negation.

(19) a. ..., weil **Kinder** ja doch $\exists[_{VP}$ im Garten spielen]. (generic reading)

b. ..., weil ja doch $\exists[_{VP}$ Kinder im Garten spielen]. (existential reading)

- *Diesing's generalization*:

  Only indefinite NPs inside VP (either at surface structure, or reconstructed at LF) can be interpreted with an existential reading, which is due to the application of existential closure at the VP-edge.

→ While EC is a good candidate for a universal mode of composition, evidence for its application is typically indirect in nature (qua the available semantic interpretations). Nonetheless, there is at least one natural language that shows overt morpho-syntactic evidence for the application of EC: the morpheme *adi* in Bura.

4. Existential Closure in Bura (Zimmermann 2007)

- The distribution of *adi:*

(20) a. pindar **adi** ata sa mbal **wa**
P. ADI FUT drink beer NEG
'Pindar will not drink beer.'

b. akwa saka laga [*mda* **adi** ka mwanki ntufu]
at time some person ADI with wife five
'Once upon a time, there was a man with five wives.'

c. *mda* **adi** [ti tsa kuga].
person ADI REL 3sg invite
'There is somebody that he invited. / SOMEBODY, he invited.'

(21) a. tsa **(*adi)** masta *su*
3SG ADI buy thing
'She bought something.'

b. *mda* **(*adi)** si
person ADI come
'Somebody/ A man came.'

→ *adi* is mandatory (with most verbs) in negated clauses, cf. (20a), in verbless thetic clauses, cf. (20b), and in existential cleft-structures, cf. (20c).

→ *adi* is illicit in affirmative episodic sentences, cf. (21ab).

→ *adi* is not a dummy verb to be inserted in the absence of full lexical verbs:

- unlike verbs, *adi* precedes the aspectual marker (20a);

- *adi* can co-occur with lexical verbs (20a);

- lexical verbs are not obligatory in Bura clauses (22a);

- *adi* cannot co-occur in clefts with referential (nor quantified) expressions (22b):

(22) a. sal-ni [mdi-r hyipa]
man-DEF person-of teaching
'The man is a teacher.'

b. **kubili* **adi** (an) [ti tsa kuga]
K. ADI PRT REL 3sg invite
INTENDED: 'It is Kubili that he invited.'

- *Generalization:*

  adi occurs whenever an individual or event variable must be existentially bound, but cannot be bound by *alternative means*

→ *adi* can co-occur with variable-introducing indefinite NPs, but never with referential or quantified expressions.

- *The analysis:*

  In the unmarked case, all variables introduced by indefinite subject and object NPs are existentially bound by the predicate-modifying variant of the verb (23b).

(23) a. tsa **(*adi)** masta *su*
3SG ADI buy thing
'She bought something.'

b. $[\![\text{masta su}]\!] = [\![\text{masta}_2]\!]([\![\text{su}]\!])$

$= [\lambda P \in D_{<e,t>}.\lambda x \in D_e.\lambda e.\ \exists y\ [P(y)\ \&\ x \text{ bought } y \text{ in } e]\ ]\ (\lambda x \in D_e.\ \text{thing'}(x))$

$= \lambda x \in D_e.\lambda e.\ \exists y\ [\text{thing'}(y)\ \&\ x \text{ bought } y \text{ in } e]$

→ In the absence of verbs, (20bc) , some other element must existentially close off the indefinite variables: *adi*

→ the outermost argument of the verb, i.e. the event argument, cannot be closed off by the verb itself, hence another element must step in to existentially close off the event variable, as required under negation (20a).

Q4: Why would existential (event) closure be mandatory with negation ?

→ The restriction in (24) is cross-linguistically attested for more familiar languages: see Herburger (2002) on Romance, and Zeijlstra (2004) on Germanic languages.

(24) $*[\![\text{NEG}]\!](\lambda e.\ \varphi(e))$

(25) Yesterday, Peter did not see a cat. (= universal negative event negation)

i. $\neg\exists$**e** [time(e) $\subseteq$ yesterday' $\wedge$ $\exists$x [cat'(x) $\wedge$ **see'**(e, peter, x)]]
≈ **there is no event** of Peter's seeing a cat that took place yesterday

ii. $\exists$**e** [time(e) $\subseteq$ yesterday' $\wedge$ $\exists$x [cat'(x) $\wedge$ $\neg$**see'**(e, peter, x)]]
≈ there is an event of Peter not seeing a cat that took place yesterday

iii. [time($g(e_1)$) $\subseteq$ yesterday' $\wedge$ $\exists$x [cat'(x) $\wedge$ $\neg$**see'**($g(e_1)$, peter, x)]]
≈ the contextually given event e_1 of Peter not seeing a cat took place yesterday

- *Possible reasons behind (24):*

i. PRAGMATIC ACCOUNT: Perhaps it is just too uninformative to negate an event predicate, given that events are typically not sortally restricted and the complement set of event predicates is in principle unbounded.

→ excluding a single event of Peter seeing a cat leaves open too many possibilities…

ii. SEMANTIC (lattice-theoretic) ACCOUNT: Perhaps event pluralities differ from plural individuals in that they do not form lattice structures - e.g. because they are overlapping and have no clear atomic parts, or are unbounded by definition - and application of the Boolean operation *complement formation* (= negation), which is only defined on lattice-structures, is illicit for this reason (see Zwarts & Szabolsci 1997 on negative islands):

(26) a. Which man didn't you invite?

b. *How/Why didn't you behave?

5. RESTRICTION in Chamorro & Asymmetric Predicate Modification (C & L 2006)**:**

- Complementation without semantic saturation: Incorporated Objects and Extra Objects:

(27) Si Carmen gäi-[**ga'**] **i ga'lagu**.
Unm Carmen Agr.have-**pet** the dog
'Carmen has the dog as pet.'

→ In 2-object constructions, the incorporated object must be indefinite

→ The extra object serves to further specify the theme argument

- Analysis in Chung & Ladusaw (2004, 2006)

→ V and incorporated object combine semantically via RESTRICT leaving the theme-argument position unsaturated;
→ the argument position is not closed off by EC, but gets its the semantic value from the extra object by FA.

(28) $\lambda y \lambda x$ Gen$_e$ [have'(y)(x)(e)] **pet'**
<e<et>> **<et>**

$\lambda y \lambda x$ Gen$_e$ [have'(y)(x)(e) $\wedge$ **pet'(y)**] **the_dog'** RESTRICT
<e<et>> <e>

λx Gen$_e$ [have'(**the_dog'**)(x)(e) $\wedge$ pet'(y)] FA

→ RESTRICT requires the incorporated object to be indefinite, i.e. of type <et>

- A curious asymmetry:

Observation: Both incorporated object and extra object can be indefinite NPs, which are both semantically composed via RESTRICT, see C&L (2006: 332)!

(29) a. Kao gäi-**[atungu']** **médiku** ?
Q agr.have-**friend** **doctor**
'Does she have any doctors as friends?' (lit. 'Does she friend-have doctors?')

b. täi-**[ga']** si nana-hu **gayu**
agr.not.have-**pet** mother-agr **rooster**
'My mother doesn't own any roosters.'

→ ***Prediction***: The order of objects should not matter,

(30) a. Yänggin gäi-[**patgun**] hao **doktu**, mu-mäguf hao gi inamko'-mu.
if agr.have-child you doctor agr-happy you Loc old.age-agr
'If you have a child who's a doctor you'll be happy in your old age.'

b. $\lambda y \lambda x \lambda e$ [(have'(y)(x)(e) $\wedge$ friend'(y)) $\wedge$ doctor'(y)] =
$\lambda y \lambda x \lambda e$ [(have'(y)(x)(e) $\wedge$ doctor'(y)) $\wedge$ friend'(y)]

→ ***Observation***: BUT IT DOES !

(30) c.?*Yänggin gäi-[**doktu**] hao **patgun**, mu-mäguf hao gi inamko'-mu.
if agr.have-child you doctor agr-happy you Loc old.age-agr
'If you have a doctor who's a child you'll be happy in your old age.'

→ The same holds generally for instances of multiple modification, in Chamorro…

(31) a. *Kao guäha tiningo'-mu ***doktu*** na ***ä 'amti chetnut kidney***?
Q agr.exist WH[obj].know-agr doctor LN(modL) healer disease kidney
('Do you know any treaters of kidney disease who are doctors?')

b. Kao guäha tiningo'-mu ***ä'amti chetnut kidney*** **na** ***doktu***?
Q agr.exist WH[obj].know-agr healer disease kidney LN(modL) doctor
'Do you know any doctors who treat (lit. are healers of) kidney disease?'

→ … and in English

(31) a. Joe wants to marry a woman who is a pilot.
b. ?? Joe wants to marry a pilot who is a woman.

→ the second modifier/restrictor cannot be a superordinate of the first

- GENERALIZATION:

  In cases of multiple modification (via RESTRICT), the second modifier must always specify a subdomain of the first modifier, and not vice versa.

→ MODIFY/RESTRICT is asymmetric !

→… as in Chamorro, linear relations seem to play a role in English/German (Fanselow 1984):

(33) a. die Datsche von Peter, die am Wannsee liegt. (restrictive interpretation OK)
b. Peters Datsche, die am Wannsee liegt. (only non-restrictive)

Q5: How can the observable asymmetries with predicate modification in Chamorro and English be implemented?

?? Can the extra object be treated as a bare kind-denoting NPs of type <e>? **NO**, cf.(29ab)

?? Are head nouns and V-OBJ-complexes of a different type as N-modifiers and extra objects; i.e. can only verbs and DP-heads introduce world-variables/indices ?

<s,et> vs. <et>

(34) a. Joe wants to marry a woman who is a pilot.

b. $\forall w'\ [w'\ R_{Joe}w_0]$: $\exists x\ [woman'(x, w') \wedge marry'(joe, x, w') \wedge pilot'(x)]$

= every desirable world w' for Joe is such that w' contains a woman x such that Joe marries x in w' and x is a pilot

c. ??Joe wants to marry a pilot who is a woman.

d. $\forall w'\ [w'\ R_{Joe}w_0]$: $\exists x\ [pilot'(x, w') \wedge marry'(joe, x, w') \wedge woman'(x)]$

= every desirable world w' for Joe is such that w' contains a pilot x such that Joe marries x in w' and x is a woman.

→ Intuitively, the woman-property (in 34a) and the pilot-property (in 34b) are more important for identifying the relevant worlds of desire (worlds in which he marries a woman or a pilot, respectively), but this is not really captured by (34bd).

(35) a. If a woman **pilot** downs the Red Baron, her male **comrades** will rejoice.

b. If a pilot **woman** downs the Red Baron, her pacifist sisters will be shocked.

?? Pragmatics ?? In adequate contexts, the degraded modifying structures are licit !

?? Conservativity ?? → see discussion on quantification

!!! NICE TOPIC FOR A PAPER !!!