Forms and functions of logical connectives in natural languages

A typological perspective

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Sketch of the talk

Logical connectives in natural languages: an introduction

The relation of logical connectives and natural languages plays a crucial role in the theoretical debate on the *borderline between semantics and pragmatics*, and is at the center of the elaboration of **Grice's theory of conversational maxims** (Grice 1989: 22, 44-85).

-- Grice's discussion of the Cooperative Principle and the maxims governing conversation indeed starts from the comparison between the three basic logical operators $\wedge, \vee, \supset$ and the corresponding connectives in natural languages, namely 'and', 'or' and 'if' connectives.

→ **Grice's aim is to preserve the semantic parallelism commonly established between Boolean logic and natural languages, by explaining the attested divergences on the basis of pragmatic principles of conversation.**

Logical connectives in natural languages:
an introduction

Since Grice, many scholars belonging to the so-called Neo-Gricean and Post-Gricean approaches have focused their attention on those connectives that look like the direct linguistic counterparts to Boolean operators

→ Their aim is to **unveil the mechanisms that govern the interpretation of logical connectives and derive non-truth-functional values from truth-functional ones.**

→ Neo-Gricean and Post-Gricean raise somewhat different issues, but all focus on a restricted number of phenomena, the most important of which concern:

i) temporal and causal interpretations of *and*-conjunction,

ii) preferred inclusive or exclusive readings of disjunction under specific circumstances,

iii) the so-called 'conditional perfection', whereby a conditional *if*-clause is interpreted as biconditional *if-and-only-if*.

Logical connectives in natural languages: an introduction

✔ **Neo-Griceans** stress the role of generalized conversational implicatures (GCIs), which normally arise across contexts unless they are blocked by specific salient assumptions, and scalar implicatures (SIs, Horn 1972, Levinson 1983).

- GCIs explain temporal and causal readings of 'and'-clauses (Levinson 2000)
- SIs are at work in the exclusive interpretation of disjunction (whose basic meaning is argued to be inclusive, see Horn 1973; Levinson 1983) and in conditional perfection (Horn 1972, van der Auwera 1997).

✔ **Grammar-driven approach by** Chierchia et al. (2001, cf. also Noveck et al. 2002: 304-305):

- systematic correspondence:
  - upward entailing contexts → exclusive interpretation of *or*
  - downward entailing contexts → inclusive reading of *or*
- potential **informativeness** of disjunction: the interpretation having the smallest number of true conditions is considered most informative and is preferred.
- **Such informational computations pertain to grammar, and not to pragmatics.**

Logical connectives in natural languages:
an introduction

✓ **Post-Griceans.** Relevance Theory framework (Sperber and Wilson 1986): greater value to inferential enrichments and to the conditions under which they are generated, than to implicatures and informativeness.

- Carston's (2002: 378-379) account of sequential *and*-clauses: activation of highly accessible narrative scripts, in which the sequential relations are represented.
- Blakemore and Carston (2005): the presence of an overt connective restricts the set of possible inferential enrichments and implies that it is the complex conjoined sentence that carries the presumption of optimal relevance.

Despite the differences, all these approaches

✓ start from the assumption that **logical meaning has to be kept as a reference point of any analysis of connectives,**

✓ **address the semantics/pragmatics border in terms of what *is*/*is not* part of the logical meaning,**

✓ **do not take into account cross-linguistic evidence** and the generalizations are driven from the exam of few languages.

Logical connectives in natural languages:
an introduction

Cross-linguistic data make the picture much more complex!

✓ *Discrepancy* between the semantic distinctions identified in Boolean logic and those actually coded by natural languages: e.g. the distinction between inclusive and exclusive disjunction is not overtly coded in the world's languages, there are languages without any 'or' and languages with more than two 'or's, languages without any 'and' and languages with different (highly specialized) 'and's.

More examples during the next 45 minutes...

✓ Theoretical proposals ignoring such discrepancies run the risk of reducing their validity to the languages on which they are based

Logical connectives in natural languages: an introduction

Aim of this talk:

> ✓ To provide a **preliminary analysis of the behaviour of logical connectives across languages** in the belief that:

i) cross-linguistic data may *challenge the assumption* that logical connectives are universal and that logic has to be kept as a reference point in the exam of natural languages;

ii) cross-linguistic data are likely to *raise new questions* for pragmatic theories;

iii) the *semantics/pragmatics borderline* in natural connectives is not necessarily based on the logic/non-logic opposition, but may be analyzed *as a flexible notch* moving along a diachronic and typological continuum, whereby what is left to pragmatics in some languages, or at some diachronic stage, may be part of the encoded semantics in other languages, or at successive diachronic stages (cf. Bybee 2006, Mauri and van der Auwera 2012).

> ✓ I will discuss: **typological variation**, **diachronic data**, and some **non-connective functions** that logical connectives may encode in natural languages

Sketch of the talk

1. Logical connectives in natural languages: an introduction

2. A typological approach to logical connectives

    2.1   Morphosyntactic variation and functional factors
    2.2   Semantic domains and multifunctionalities

3. Diachronic glance: where do logical connectives come from?

4. Logical connectives and their non-connective functions

5. Conclusions: what is yet to be done?

A typological approach to logical connectives

Preliminary remark:

✓ I mainly focused on conjunction and disjunction

- **Mauri 2008a**: cross-linguistic study on coordination relations taking into account how 74 languages (37 European and 37 non-European) encode '**and**', 'but', '**or**' relations.
- **Giacalone Ramat and Mauri 2011, Mauri and Giacalone Ramat to appear**: diachronic paths leading to the development of 'and', 'but' and 'or' connectives, with special focus on adversatives in Romance languages.

✓ Recently, I started working on conditionals too ('if')

 Mauri and van der Auwera 2012: comparative work on logical connectives in natural languages, with a view to the most recent pragmatic theories → preliminary study

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

Main morphosyntactic properties of basic logical connectives in European languages:

- **Overt** connectives
- **Invariable free** particles, usually **non-analyzable in smaller morphemes**
- For conjunction and disjunction:
  occuring at **all syntactic levels** (NPs, PPs, VPs, clauses)

→ Let us see whether this can be really considered the "normal" situation...

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

✓ **Syntactic domain**

'and' and 'or' relations may be established between different linguistic units (clauses, VPs, ADJPs, NPs, etc.). The set of syntactic types that may be linked by a given connective is called **syntactic domain** of the connective.

→ Haspemath (2005): it's frequent to find different structures for NP conjunction and VP/clause conjunction

→ Payne (1985: 5): implicational cline constraining the possible syntactic domains of connectives: S – VP – AP – PP – NP.
The prediction is that individual constructions are restricted to cover contiguous categories, e.g. S and VP, or AP, PP and NP.

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

(1) Korean, isolate (Sohn 1994: 118-125)

(a) *na-nun ilpon-ey ka-(ss)-ko Minca-nun mikwuk-ey ka-ss-ta*
  I-CTOP Japan-to go-(PST)-**and** Minca-CTOP America-to go-PST-DECL
  'I went to Japan and Minca to America.'   → **syntactic domain** [CLAUSE]

(b) *Minca-wa/hako/lang Yongho-nun umak-ul culki-n-ta*
  Minca-**and**   Yongho-CTOP music-ACC enjoy-IND-DECL
  'Minca and Yongho enjoy music.'   → **syntactic domain** [NPs]

(c) *Yongho-ka   wa-ss-kena Minca-ka wa-ss-ta*
  Yongho-NOM come-PST-**or** Minca-NOM come-PST-DECL
  'Either Yongho or Minca came.'   → **syntactic domain** [CLAUSE]

(d) *na-nun pap-ina cwuk-ul mek-keyss-ta*
  I-CTOP rice-**or** gruel-ACC eat-FUT-DECL
  'I will eat rice or gruel.'   → **syntactic domain** [NPs]

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

✓ **Morphological complexity**

Logical connectives in natural languages may have different degrees of morphological complexity, which can be measured on the basis of

- **syntactic bondedness:** FREE | AFFIX | CLITIC
- **number of morphemes**: MONOMORPHEMIC | POLYMORPHEMIC

		Free	Polymorphemic
Hebrew	*-ve* 'and'	~	~
Korean	*-kena* 'or'	~	~
Italian	*o*	+	~
Mandarin	*rúguŏ* 'if'	+	+
Cavinena (Tacanan)	*jadya=ama ju-atsu* thus=NEG be-SS *(being not thus, if it is not so)* > 'or' (Guillaume 2004: 114)	+	+

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

➔ In a given language, *overt disjunctive connectives are at least as morphologically complex as conjunctive connectives.*

	Conjunctive	**>**	**Disjunctive**
German	*und*	>	*oder*
Dargi	*wa, ya*	>	*Yara, aħi*
Hausa	*kuma*	>	*ko**kuma***
W. Greenlandic	*=lu*	>	***=lu**unniit*
S-Croatian	*i, a, þa*	>	*ili*
Basque	*eta*	>	*edu, ala*

➔ The more general and basic a connective, the higher its frequency in discourse.
➔ Combination is the simplest relation because it only establishes the cooccurrence of two SoAs, so it is the most frequently used in discourse (Ohori 2004: 61) Therefore, **conjunctive connectives tend to be simpler than disjunctive connectives.**

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

✓ **Presence vs. absence of overt connectives**

➜**There are languages without overt connectives meaning 'and', 'or' and 'if', or allowing for such connectives only under special circumstances**

(2) Chechen, Nakho -Daghestanian, Caucasic (Jeschull 2004: 252-253)

(a) *peetar-ie juxa-vaxaniehw chai 'a mer dara, byysa 'a*
    inn-ALL back-go.PST.COND tea AND drink.FUT be.IMPF night AND

    joaqq-ur jara
    spend- FUT be.IMPF
    'if we had returned to the inn, we could have drunk tea and spent the night [. . .]'

(b) *Mox c'iiza byylira darc hwovziira*
    wind howl.INF start.WP blizzard turn.around.WP
    'The wind started to howl and the blizzard turned around.'

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

(3)   Malayalam, Tamil-Kannada, Dravidian (Asher and Kumari 1997: 140)

(a)   *niŋŋaíkkə   kiṭakkayil   kiṭakkaam   all"ŋkil   paayayil   kiṭakkaam*
      2sg:DAT   bed:LOC   lie:PERMIS   OR   mat:LOC   lie:PERMIS
      'You can lie here **or** you can lie on the mat.'

(b)   *innale   raaman   vann-oo   vannill-ee?*
      yesterday   Raman   come:PST-INT   come:PST:NEG-INT
      'Did Raman come yesterday **or** he did not come?'

(4)   Kusunda (isolate; Watters 2006: 172)
      na   t-əm-da-n   t-o ˤG-da-k
      this   1-eat-PL-R   1-die-PL-**IRR**
      'If we eat this we will die.'

A typological approach to logical connectives.
Morphosyntactic variation and functional factors

→ The interesting question is:
how do languages lacking overt connectives for 'and', 'or' and 'if' relations convey logical relations?

Or in other words...
What are the necessary conditions to INFER logical relations in those cases where no connective is available?

Let's wait some more slides for a preliminary answer...

Sketch of the talk

A typological approach to logical connectives.
Semantic domains and multifunctionalities

• Looking at the world's languages, we can observe several subtypes of conjunctive, disjunctive and conditional relations, i.e. more fine-grained distinctions that languages may encode through dedicated connectives

→The set of relations for which every attested construction may be used will be called SEMANTIC DOMAIN: *dedicated vs. general connectives*

→We can identify a non-exhaustive list of subtypes of relations that logical connectives may encode in natural languages: focus on conjunction and disjunction

A typological approach to logical connectives.
Semantic domains and multifunctionalities

__Combination__: depending on the location of the SoAs on the temporal axis
(cf. Longacre 1985), it may be:

➤ TEMPORAL SEQUENTIAL: *'I opened the door and went away.'* (3a, 3b)
➤ TEMPORAL SIMULTANEOUS: *'He is dancing and clapping his hands.'* (3c, 3d)
➤ATEMPORAL: *'Doctors are rich and lawyers marry pretty girls.'* (5a)

(5)   Serbo-Croatian, Slavic

a)   *Zauzet   sam   i   ne   mogu   više   slušati*
Busy   be:1SG and   NEG   can:1SG anymore   listen
'I'm busy and I can't listen anymore.' (Brown and Alt 2004: 70) → **general** COMB

b)   *Čuo   sam   grmljavinu   pa   je   počela   kiša*
hear:PTCP.PST AUX:1SG thunder:ACC SEQ   AUX:3SG   begin:PTCP.PST   rain
'I heard a thunder and it started to rain.' (M.C., questionnaire) → **dedicated** SEQ

c)   *Ivan putuje   a   i   Marija   putuje*
Ivan travel.3SG   NSEQ too   Marija   travel.3SG
'Ivan is travelling and (*while) Marija is travelling too.' (Brown and Alt 2004: 70)
→ **general** NSEQ

A typological approach to logical connectives.
Semantic domains and multifunctionalities

(6) Lithuanian, Baltic, Indo-European

(a) *Aš dirbu   o   Petras miega*
     I   work:PRS.1SG NSEQ Peter   sleep:PRS.3SG
     'I work **and** Peter sleeps.' (L.R., questionnaire) → **general NSEQ, OPP, COR**

(b) *Petras nesimoko   savo kambaryje o   žaidžia   sode*
     Peter   NEG:study:PRS.3SG his room:LOC NSEQ play:PRS.3SG garden:LOC
     'Peter is not studying in his room **but** he's playing in the garden.' (V.Ž., questionn.)

(7) Russian, Slavic

a) *Vremja uxodit   bystro,   a   s   nim   uxodjat   ljudi*
    time   pass:3SG   quickly   NSEQ with it   pass:3PL   people
    'Time passes quickly and (*while) with it people pass (away).' (Malchukov 2004: 183)

b) *Ego zovut   ne   Petja, a   Vanja*
    he   call:PTCP.PST   NEG Petja NSEQ   Vanja
    'His name is not Petja, but Vanja' (Malchukov 2004: 192) → **general NSEQ, OPP, COR**

c) *Vanja   prostudilsja   no   poshel   v   shkolu*
    Vanja   caught.cold   COUNT   went   to   school
    'Vanja caught cold but went to school' (Malchukov 2004: 180) → **dedicated COUNT**

	SEQUENTIAL	SIMULTAN.	ATEMPORAL	OPPOSITIVE	CORRECTIVE	COUNTER EXP
Mangarayi			---			*gana*
Tuvaluan	---			*kae*		
Hdi	*là*					
			---			*àmá*
Maori	*aa*	hoki				
			---		*engari*	
Russian		*i*				
				a		*no*
S-Croatian		*i*				
	pa		*a*		*već*	*ali*
Polish		*i*				
			a		*ale*	
German		*und*			*sondern*	*aber*
Italian		*e*			*ma*	
				mentre	*bensì*	*però*

A typological approach to logical connectives.
Semantic domains and multifunctionalities

Alternative: depending on the necessity to make a choice between the available
possibilities (cf. Haspelmath 2007, Mauri 2008a: ch.5, Mauri 2008b), it may
be:
- ➤ CHOICE-AIMED: '*Do you come with us or do you stay here?*'
- ➤ SIMPLE: '*Usually, I watch TV or I read until late at night.*'

(8) Somali, Cushitic, Afro-Asiatic (Saeed 1993: 275)
(a) *Amá wuu kéeni doonaa amá wuu sóo.díri doonaa*
    ALTS 3SG bring that ALTS 3SG send that
    '**Either** he will bring it **or** he will send it.'
(b) *ma tégaysaa misé waad jóogaysaa?*
    INT go:2sg ALTC here stay:2sg
    'Are you going **or** are you staying?'

→It is typologically very frequent to find languages showing an overt disjunctive
connective **only for simple alternative!** (examples (9) and (10))
→Choice-aimed disjunction is conveyed through the *juxtaposition of interrogative clauses*

A typological approach to logical connectives.
Semantic domains and multifunctionalities

(9)   Malayalam, Tamil-Kannada, Dravidian (Asher and Kumari 1997: 140)

(a)   *niŋŋaíkkə   kiʈakkayil   kiʈakkaam   **alleŋkil**   paayayil   kiʈakkaam*
      2sg:DAT   bed:LOC   lie:PERMIS   ALTS   mat:LOC   lie:PERMIS
      'You can lie here **or** you can lie on the mat.' →**dedicated** ALTS

(b)   *innale   raaman   vann-oo   vannill-ee?*
      yesterday   Raman   come:PST-INT   come:PST:NEG-INT
      'Did Raman come yesterday **or** he did not come?' →**no disjunctive connective**

(10) Korean

(a)   *wuli-ka   ka-l-kka-yo?   salam-ul   ponay-l-kka-yo?*
      1PL-NOM   go-PRS-Q-POL   person-ACC   send-PRS-Q-POL
      'Shall we go or shall we send a person?' (Sohn 1994: 122) → **no disjunct. connective**

(b)   *Minsu-ka   o-**kena**   nae-ka   ka-n-ta.*
      Minsu-NOM   come-ALTS 1sg-NOM   go-INCOMP-DECL
      'Minsu comes here or I go there.' (Y.M.S., questionnaire) →**dedicated** ALTS

A typological approach to logical connectives.
Semantic domains and multifunctionalities

There are also languages completely **lacking an overt disjunctive connective**: **NO 'OR'!**
... HOW IS THE ALTERNATIVE RELATION EXPRESSED IN SUCH CASES?

(11) Wari', Chapacura-Wanam (Everett and Kern 1997: 162)
(a) *mo*   *ta*   *pa' ta'*   *hwam ca,*   *mo*   *ta*
    COND   realis.future kill 1SG:realis.future fish   3sg.M COND   realis.future
    pa' ta'   *carawa ca*
    kill 1SG:realis.future animal 3SG.M
    'Either he will fish or he will hunt.' (lit. 'if he (says) "I will kill fish", if he (says) "I will
     kill animals".')
(b) *'am*   *'e'*   *ca*   *'am*   *mi' pin*   *ca*
    perhaps live 3SG.M **perhaps** give complete 3SG.M
    'Either he will live or he will die.' (lit.'perhaps he will live, perhaps he will die')

(12) Hup (Vaupés Japurá, Epps 2005: 683)
    wĩh   cím'-íy=cud   *ʔûhníy, ya ʔambŏʔ   g'əç-əy=cud*   *ʔûhníy*
    hawk claw-DYNM=INFR   **maybe** dog   bite-DYNM=INFR   **maybe**
    'Either the hawk clawed (it), or the dog bit (it), apparently.'

A typological approach to logical connectives.
Semantic domains and multifunctionalities

→The two juxtaposed states of affairs are internally marked as **non factual** – through epistemic, dubitative, irrealis markers - in order to encode their **potential, rather than factual** status: the alternative is conveyed through a **combination of possibilities.**

→If there is no overt disjunctive connective, in order to make the alternative relation inferable, the linked states of affairs have to be explicitly marked as **non-factual possibilities** (cf. Mauri 2008b)

Given a slot 'X' in a possible world, it can be occupied by only one of the two alternative SoAs *at a time* → two alternative SoAs are conceptualized as **equivalent possibilities**, only one of which will or did actually take place at the specific moment which constitutes the free slot 'X'.
Until a choice is made or the speaker comes to know which hypothesis is realized at that given time, either SoA could be the non-occurring one and therefore both are conceptualized as irrealis.

A typological approach to logical connectives.
Semantic domains and multifunctionalities

A similar restriction on inferability can be identified for conditional constructions (Mauri and van der Auwera 2012):
if no conditional connective is present, at least one of the linked SoAs has to be marked as potential (irrealis) in order for the conditional relation to be inferrable.

(13) Caodeng rGyalrong (Sino-Tibetan, Tibeto-Burman, spoken in China; Sun 2007: 805)
    neɟiʔ   təciʔ-naŋ   e-ne-tə-nəmder-nəʔ   eɟiʔ-ntʃʰon   nəmder-aŋ
    2SG   water-inside IRR1-IRR2:DOWN-2-jump-SUB 1SG-also   jump-1SG
    'If you jump into the water, I will jump too.'
    → irrealis marker in the protasis only, no conditional connective

> What distinguishes conditional relations from temporal and, especially, causal ones is indeed the **uncertainty of the condition**, which makes the whole co-occurrence of the two SoAs a **possibility, rather than a fact (or a non-fact)**. If we thus analyze conditionals as conveying a potential causal relation, we may easily understand why many languages basically employ the same underspecified strategy both for conditional and causal clause linkage, crucially distinguishing the two by means of modal operators (cf. Comrie 1986 and Haiman 1986)

A typological approach to logical connectives.
Semantic domains and multifunctionalities

The semantic domains of logical connectives in natural languages vary a lot: there are even laguages where the same connective may be employed for both combination and alternative: example (14) → extreme **underdifferentiation**, where it is CONTEXT that helps in desambiguating the two values: interrogative context associates with disjunctive value (assumption of epistemic uncertainty) and declarative context with conjunctive value (Ohori 2004: 57)

(14) Upriver Halkomelem (Salish, Ohori 2004: 57)
a)   Lə´   ləmə´lstəxʷəs tə   Bill tə   sq'ə´mə´l xʷəlɛm tə   Jim **qə** Bob.
      3   throw.3   DEM Bill DEM paddle   to   DEM Jim **and** Bob
      'Bill threw the paddle to Jim and Bob.'
b)   Lí   lɛm k'ʷə Bill **qə**   Bob?
      Q   go   DEM Bill **or**   Bob
      'Did Bill or Bob go?'

Sketch of the talk

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2. A typological approach to logical connectives
   2.1   Morphosyntactic variation and functional factors
   2.2   Semantic domains and multifunctionalities

3. Diachronic glance: where do logical connectives come from?

4. Logical connectives and their non-connective functions

5. Conclusions: what is yet to be done?

Diachronic glance:
where do logical connectives come from?

→ Very few diachronic surveys on logical connectives: Traugott 1986, Mithun 1988 for conjunction; Haiman 1978, 1986 for conditionals; Mauri 2008b, Giacalone Ramat and Mauri 2011 for conjunction and disjunction.

→ There is still **A LOT** to do!!

→ Diachronic analyses unveil the connections between logical connectives and neighboring functional domains, from which the forms are exploited.

(15) Nakanai, (Austronesian, Eastern Malayo-Polynesian, Oceanic, Johnston 1980: 239)
a) *Egite la   ilali ouka.*
   they NM food no
   'They had no food. '
b) *Eme   masaga ale nabatu,   (ou)ka (eme   masaga) ale nabauan?*
   You.SG like   that number.two or   you.SG   like   that number.one
   'Do you like the second or the first one?'

Diachronic glance:
where do logical connectives come from?

(16) Polish
a)   *Czy* *pan dużo*   *podróżuje?*
      Q   you much travel
      'Do you travel a lot?'
b)   *Idziemy*   *jutro*   *do szkoły*   *czy*   *zostajemy*   *w domu?*
      go.PRS.1PL   tomorrow to school ALTC   stay.PRS.1PL at home
      'Do we go to school tomorrow or do we stay at home?'

(17) Nkore-Kiga, Niger-Congo, Bantoid (Taylor 1985: 58)
      n-ka-za-yo   *na*   *Mugasho*
      1SG-REC.PST-go-there   and/with   Mugasho
      'Mugasho and I went there./ I went there with Mugasho.'

Diachronic glance: where do logical connectives come from?

Table 54.1. Diachronic sources for conjunctive connectives

Source meaning	Examples
1. Spatial and temporal meanings of linear succession 'in front', 'after, before, then'	I.E. *hanti, hant- 'in front' > O.Saxon ant-, Goth. and(a)- 'in front' [cognate to Lat. ante 'in front, before', Gr. antí 'in front, against', Hit. ánti] > Engl. and, Germ. und (cf. Traugott 1986: 141, Kluge and Seebold 1989: 179, 749)
2. Focal additive particles 'also, too'	I.E. *eti 'also, too' > Lat. et 'also, and', Gr. éti 'furthermore'; Slavic i: 'also' > 'and' (Meillet 1958: 165, cf. also Mithun 1988)
3. Paragraph linking strategies, particles and adverbs 'besides', 'moreover', 'and then'	Mohawk (Northern Iroquoian) tahnu': 'besides' > 'and' (Mithun 1988: 347);
4. Comitative markers	Sarcee (Athapaskan) mih 'with' > 'and' (Mithun 1988: 349; see also Stassen 2001)
5. Verbs meaning 'go', 'bring' in narrative contexts	Hdi (Chadic) lă 'to go' > 'and then' (Frajzyngier and Shay 2002: 428–31); Tetun (Austronesian) hodi 'to bring' > 'and then' (van Klinken 2000: 354–7)
6. Pronominal roots	I.E. 'proximal stem' *tó > Hittite ta 'and' (Luraghi 1990: 65–70), OCS ta, to, ti 'and', Ukr. ta 'and'

Diachronic glance: where do logical connectives come from?

Table 54.2. Diachronic sources for disjunctive connectives

Source meaning	Examples
1. Distal meaning 'that, other'	Dan. Nor. Swe. *eller* 'or' < Proto-Germanic **alja-*, **aljis-* 'other' (Falk and Torp 1910: 187); I.E. **au-* 'other, that' > Lat. *aut* (**auti*) 'or', *autem* 'but' > It. Sp. Cat. *o*, Fr. Port. *ou*;
2. Interrogative particle	Instrumental form of Common Slavic **ch'to* 'what' > Cz. Pol.: *czy*, Bel. *ci* 'choice-aimed or';
3. Free choice verbs	Lat. *vel* 'want' > 'simple or', Fr. *soit . . . soit* 'be it' > 'either . . . or'
4. Dubitative particles 'perhaps'	Kuuk Thaayorre (Pama-Nyungan) =*okun* 'DUB' > 'or' (Gaby 2006: 323–4); Rus., Bulg., S-Cr.: *i* ('and') + *li* (dubitative particle) > *ili* 'or'
5. Negative particles	Nakanai (Oceanic) *(ou)ka* 'NEG' > *ka* 'or' (Johnston 1980: 239)
6. Denied conditional clause 'if not', 'if it is not so'	Cavineña (Tacanan) *jadya*=*ama ju-atsu* 'thus=NEG be-ss' (lit. being not thus, if it is not so) > 'or' (Guillaume 2004: 114); Lezgian *taˆxajt'a* 'or' < conditional form of the negated aorist participle of ˆ*xun* 'be', meaning 'if it is not' (Haspelmath 1993: 332); Italian *sennò* 'otherwise' < *se* 'if' + *no*

Diachronic glance:
where do logical connectives come from?

✓ **Conditionals.**

Haiman 1978: in case the strategy employed for conditionals may also be used for other functions, such functions frequently include **polar interrogatives** and **topics** → **recurrent diachronic sources for conditional connectives**

(18) Hua (Haiman 1978)
      E -si **-ve**   baigu -e.
      Come-3SG.FUT-**INT**   will.stay-1SG.
      'Will he come? I will stay; If he will come, I will stay.'

→The same tendency is attested in a number of unrelated languages, such as Russian, Turkish, Mayan languages and Germanic languages (e.g. English *Should you need any help, let me know*, where the subject inversion in the protasis is the same as in polar questions).
→ Consider also the path *conditional > embedded polar interrogative*: e.g. *Je me demande s'il viendra*

Diachronic glance:
where do logical connectives come from?

Why?

✓ *Polar questions* and *conditionals* share the **prototypical topical status of the antecedent**, with respect to the consequent (in polar questions, the antecedent is the question, and the consequent is the answer)

✓ This motivates the multifunctionality patterns and the diachronic paths attested: according to Haiman (1978: 586), at the *NP level*, **the topic presupposes the existence of its referent**, while at the *sentence level,* it is the **truth of the described proposition** (in particular, the existence of the SoA described in the conditional proposition) which is presupposed.

→ Interestingly, an analysis of the protasis in terms of its topical status is also proposed by Jacszcolt (2005: 217), with respect to the bi-conditional interpretation of *if*-conditionals

Diachronic glance:
where do logical connectives come from?

(19)   a. If you mow the lawn, I'll give you five dollars.
          b. If and only if you mow the lawn will I give you five dollars.
          c. I'll give you five dollars just in case/only if you mow the lawn.
          d. If you don't mow the lawn, I won't give you five dollars.

✓ van der Auwera (1997): phenomenon due to **scalar implicatures** (Horn 1972; Gazdar 1979).

✓ Jacszcolt (2005: 217) challenges the undisputed step from conditional to biconditional, and instead interprets the invited inferences illustrated in (19) as "a restriction of the domain of discourse, or, alternatively, a restriction (specification) of the topic of discourse". In other words, in her view 'mowing the lawn' is established as the topic of the discourse and issuing a conditional request is the purpose of the speech act.

→ Cross-linguistic and diachronic data seem to confirm Jaszczolt's account of conditionals protases in terms of topics.

Diachronic glance:
where do logical connectives come from?

Further recurrent diachronic sources for conditional markers (Frajzyngier 1996: 373-415, evidence from Chadic languages)**:**

✓ <u>temporal markers</u>: e.g. Germ. *wenn*, It. *quando* with subjunctive
✓ <u>locative prepositions:</u> **<** **at** *p*, then *q* e.g. Hona (Chadic) *à* 'on, if, when'
✓ <u>demonstrative, definite markers:</u> definite **>** 'given' **>** 'when, if'

→ Close connection with two functional domains:

✓ **temporal sequentiality**: *p* precedes *q*, at the time when *p*, *q*
✓ **given information, topic**: given *p*, *q*

More research has to be done on this topic...

Sketch of the talk

1. Logical connectives in natural languages: an introduction

2. A typological approach to logical connectives

    2.1   Morphosyntactic variation and functional factors

    2.2   Semantic domains and multifunctionalities

3. Diachronic glance: where do logical connectives come from?

4. Logical connectives and their non-connective functions

5. Conclusions: what is yet to be done?

Logical connectives and their non-connective functions

Connectives in natural languages, and specifically logical connectives in natural languages may do more than linking and may encode further dimensions of meaning (illocutionary, aim, e.g. *choice-aimed disjunction*, referential function, scalar values).

→ This is a crucial difference with respect to logical connectives, maybe the most characterizing one. Yet, no systematic studies have been done on this!

→ I will briefly go through two functional dimensions that may be encoded by logical connectives:

✓ **Logical connectives encoding <u>reference </u>to further non-specific elements**

✓ **Logical connectives encoding some <u>scalarity</u> between the linked elements**

Logical connectives and their non-connective functions

✓Logical connectives encoding *reference* to further *non-specific* elements, besides the ones explicitly linked by the connective

(20) Italian

[...] una serie di attivita' che le persone che lavorano non [...] possono
a series of activities that DEF people who work.3PL NEG can.3PL

sviluppare quindi **non so** *dall' andare a fare le file alla*
develop therefore NEG know.1SG from.DEF go to do DEF.PL queue.PL at.DEF

posta 〔*piuttosto che*〕 *eh avere una baby-sitter all' ultimo momento [...]*
post.office piuttosto che eh to.have INDEF baby-sitter at.DEF last moment

〔*piuttosto che*〕 *non so organizzare ecco una festa per una mamma*
piuttosto che NEG know.1SG to.organize DM INDEF party for INDEF mother

che lavora al suo bambino
who works to.DEF her child

'a series of activities that people who work cannot undertake, so I don't know, from staying in a cue at the Post Office eh, **piuttosto che** (OR) having a last-minute babysitter [...] **piuttosto che** (OR) I don't know organizing yeah a party on behalf of a working mother for his child [...]' (LIP, R E 8 12 B)

Logical connectives and their non-connective functions

The semantics of **disjunctive *piuttosto che*** partially overlaps with *o* 'or', but shows a number of restrictions:

• it can only be used when the <u>set of potential alternatives is non-finite</u>, i.e. the speaker is exemplifying a (more or less abstract) category by providing some potential exemplars.

→The list is non-exhaustive and the use of the connective *piuttosto che* **implies reference to further non-specific potential alternatives,** in most cases not even known to the speaker (cf. *piuttosto che **non so** 'piuttosto che* I don't know' in example (13)).

Logical connectives and their non-connective functions

→ **Similar cases in Japanese**

Japanese *ya* (21) implies that the items stated are taken as *examples from a larger group of items* and that the list of connected elements is **non-exhaustive**. The equivalent for verbs is *–tari* (22). In contrast, *to* implies that the items stated are the only ones under consideration, and that no implicit reference is made to further elements.

21) *Watashi no   heya   ni wa,   konpyūtā   ya   sutereo ga   oite*
     I   DET room   in TOP computer   and stereo SUB   place-SUSP
     arimasu.
     be-POLITE.NONPAST
     'In my room there is a computer, a stereo and other similar things.' (Chino 2001: 41)

Logical connectives and their non-connective functions

(22) Japanese (Chino 2001: 108-109)

a. *Nichiyōbi wa   taitei   tomodachi to   tenisu o | shi-tari | eiga o   mi ni*
   Sunday TOP usually friend   with tennis OBJ do-and film OBJ   see to
   | *it-tari* | *shimasu*
   go-and   do.POLITE.NONPAST
   'On Sundays I usually do **such things as** play tennis with my friends or go to see movies.' (… but these are not the only things I do, there are other activities that I am not mentioning)

→Japanese connectives *ya,toka, -tari* are usually labeled **non-exhaustive connectives**, and they can be used for both conjunction and disjunction, when the speaker makes implicit reference to further non-specific items that could be listed.

Logical connectives and their non-connective functions

Logical connectives encoding some scalarity between the linked elements: conditional connectives

✓ Logical connectives, especially conditional ones, may also encode functions having to do with the <u>speaker's commitment and evaluation of the linked entities</u>, such as scalar values. Let us see some examples from Italian:

- **Speaker's expectations regarding the likelihood of p**: Italian *casomai* 'just in case (p)' provides a good example of conditional connective encoding a low expectation of realization of the protasis, independently of the apodosis. Emotive or empathic function.

(23) *Casomai*   *passasse,*   *digli*   *che* *torno*   *presto*
      in case   passed.by:3sg tell:him   that come.back:1sg soon
      'In case he passed by, tell him I'll be back soon.' (I don't think he is going to pass by)

Logical connectives and their non-connective functions

- **Scalar relation:** there are also connectives like Italian *purché* which may, in specific contexts, encode a complex acceptability scale: '*q, purché p*', and even more '*q, pur di p*', means that the speaker **considers the realization of *p* a necessity** (i.e. *its non-realization is non-acceptable*) and further **characterizes *q* as acceptable, but at the bottom of an evaluative scale** i.e. (it is the last thing Speaker wants, but she still accepts it).
- The scalar reading is only allowed when the semantics is also purposive, so that *p* coincides with the Speaker's aim.
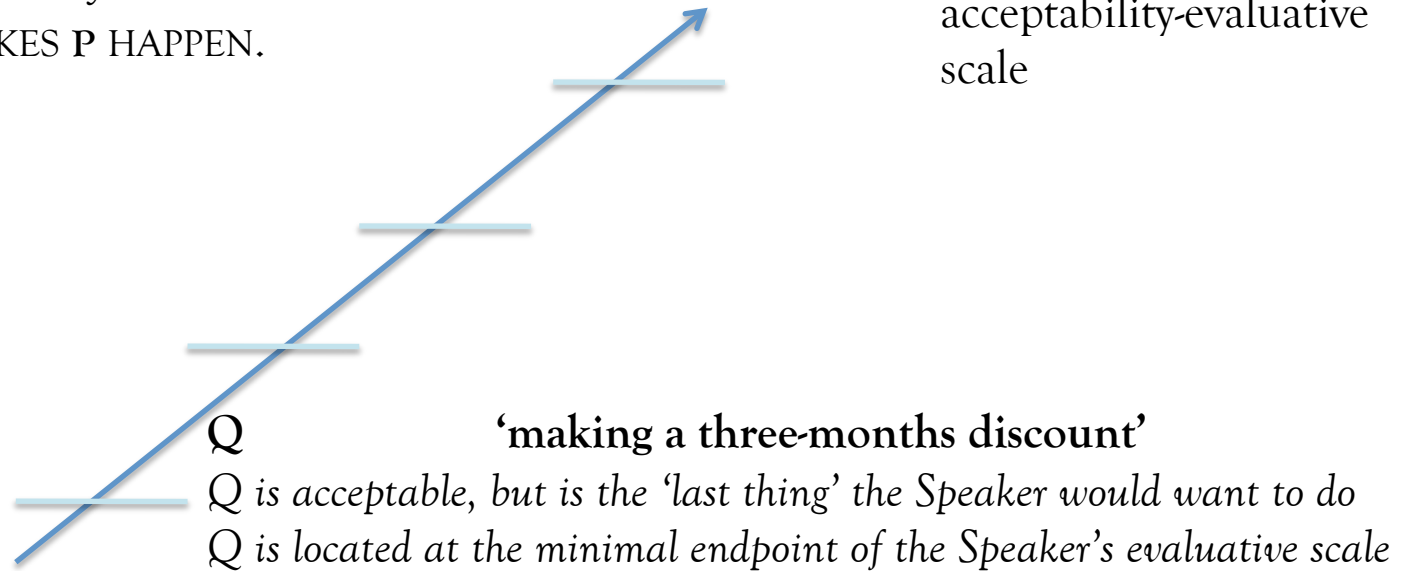
(24) *Gli abbuono tre mesi di affitto,* purché *se ne vada*
CLIT discount 3 months of rent provided.that REFL CLIT go.away
'I make a three-months rent discount, provided that he goes away./if he goes away'

(25) *Gli abbuono tre mesi di affitto,* pur di *non vederlo più*
CLIT discount 3 months of rent in.order.to NEG see.him anymore
'I'd rather make a three-months rent discount, than seeing his face again/In order not to see his face again, I would (even) make a three-months rent discount/I would even make a three-months discount, if (*I knew*) he went away'

Logical connectives and their non-connective functions

Speaker wants P so badly that
EVEN Q, IF IT MAKES **P** HAPPEN.

Pur di encodes this acceptability-evaluative scale

Q   **'making a three-months discount'**
Q is acceptable, but is the 'last thing' the Speaker would want to do
Q is located at the minimal endpoint of the Speaker's evaluative scale

NECESSITY – ACCEPTABILITY THRESHOLD

P   **'not seeing his face again'**
P   **'he goes away'**
P is a necessity, non-P is not acceptable

Logical connectives and their non-connective functions

(26) *piuttosto che*   *stare con   uno   che   ha   la   fissa   per il   calcio,*
  rather   than stay with one who has the obsession for the football
  rimango   sola [...]
  remain.1SG   alone
  'I'd rather stay alone, than with somebody who has an obsession for football'
  (http://forum.alfemminile.com/forum/couple2/f249329_couple2.html)
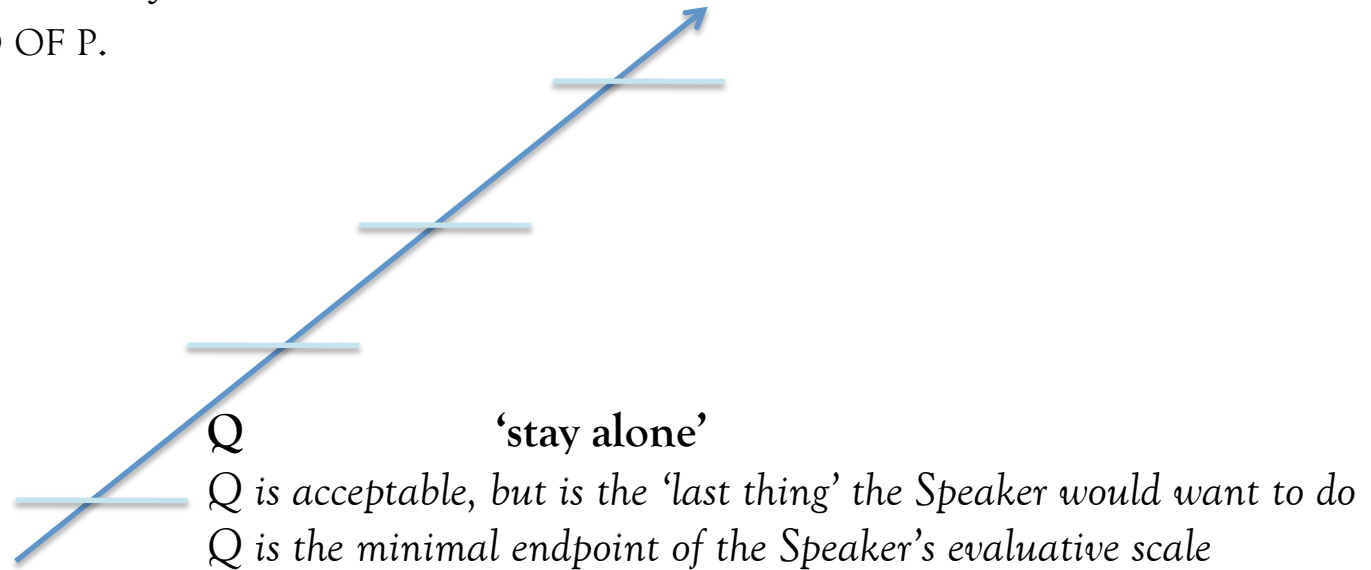
→ In the preferential comparative construction [piuttosto che *p*, *q*], *p* is despised and not
 acceptable, *q* is the minimal endpoint of an evaluative scale and indicates the least
 valued (<u>but still acceptable</u>) item among a ranked set of alternatives. *Piuttosto che*
 'rather than' introduces the 'not acceptable choice' and characterizes the preferred
 option as the 'least desirable, but still acceptable' choice.

→ **Polarity inversion!**

Logical connectives and their non-connective functions

*Speaker wants **not-P** so badly that*
EVEN Q, INSTEAD OF P.

Q   **'stay alone'**
Q is acceptable, but is the 'last thing' the Speaker would want to do
Q is the minimal endpoint of the Speaker's evaluative scale

NECESSITY – ACCEPTABILITY THRESHOLD

P   **'marry someone with an obsession for football'**
P is not acceptable, is under the acceptability threshold

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Conclusions: what is yet to be done?

Cross-linguistic data show that the logical relations 'and, 'or', 'if' can be expressed through different **degrees of coding**:
✔ they may be **fully encoded** (one connective for one logical relation, dedicated connectives), with little or no room for ambiguity and inferential enrichment;
✔ they may be **undercoded**, by means of general connectives that can be employed for a different relations

→ In the latter case, the part of meaning provided by the connective has to be **enriched** in order to derive the intended message.

→ The higher the degree of coding of the relation, the less is left to inference

Conclusions: what is yet to be done?

A typological-diachronic approach to logical connectives makes the **dynamic balance between semantics and pragmatics** evident → what is encoded in the semantics of a connective in a given language, or at a given diachronic stage, may be left to inference in another.

Two major observations:
• the world's languages put the borderline between coding and inferencing at different points along the semantics-pragmatics continuum,
• such borderline may move across time, so that (highly) specialized connectives may arise from undercoded constructions, through pragmatic processes.

Situations of UNDERCODING are extremely frequent → **CONTEXT has a crucial role in favoring or inducing specific inferential enrichments.**

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Conclusions: what is yet to be done?

Back to the hypotheses stated at the beginning of this talk:

i) cross-linguistic data may *challenge the assumption* that logical connectives are universal and that logic has to be kept as a reference point in the exam of natural languages

✓

ii) the *semantics/pragmatics borderline* in natural connectives is not necessarily based on the logic/non-logic opposition, but may be analyzed *as a flexible notch* moving along a diachronic and typological continuum, whereby what is left to pragmatics in some languages, or at some diachronic stage, may be part of the encoded semantics in other languages, or at successive diachronic stages (cf. Bybee 2006, Mauri and van der Auwera, to appear)

✓

iii) cross-linguistic data are likely to *raise new questions* for pragmatic theories

??

Conclusions: what is yet to be done?

There is a lot to do…

✓ Representative typological sample

✓ Comparable and comparative typological analysis of 'and', 'or', 'if' connectives in natural languages

✓ Comparable and comparative diachronic analysis of 'and', 'or', 'if' connectives in natural languages

✓ Systematic exam of the what non-connective functions may be encoded by logical connectives in natural languages: are certain functions more likely to be encoded by particular connectives (e.g. referential function by disjunctive connectives, scalar values by conditional connectives, etc.)

Thank you !

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