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The cartography of syntactic structures: results and implications for cognitive studies

1. Cross-linguistic scope of cartographic studies

Cartographic studies have charted the fine structure of clauses and phrases over about 20 years. The emerging picture is that each layer of a traditional syntactic structure like (1) can be seen as an abbreviation for a much richer structural zone; for instance, the CP layer is split into finer components under the cartographic magnifier, and is expanded as in (2). This configuration looks fractally related to (2), once the magnification is increased:

(1) $[_{CP} ... C ... [_{IP} ... I ... [_{VP} ... V ...]]]$ (Chomsky 1986)

(2)   [Force [Top* [Int [Top* [Foc [Top* [Mod [Top* [Q_{emb} [Fin [$_{IP}$ …]]]]]]]]]]]
                                                                                   (Rizzi & Bocci 2016)

More generally, complex **functional sequences** emerge for each zone of the tree: CP and IP, but also DP, PP, AP, VP, etc. (see Rizzi & Cinque 2016 for an overview) .

The cartographic program turned out to have a strong heuristic capacity, which quickly led to a vast cross-linguistic coverage, and to the discovery of rich sets of properties of functional sequences: ordering, mutual incompatibility between positions and other distributional constraints, freezing effects, etc.

Let me give a very rough overview of the cross-linguistic coverage of cartographic studies. The following is a partial and largely arbitrary list of publications or dissertations. The initial empirical core was largely based on **Romance** and **Germanic** (very clearly for Rizzi's 1997 analysis of the left periphery, whereas Cinque's 1999 analysis of the IP system was phrased from the outset in larger comparative terms), but this line of research quickly proved of general relevance, and was extended to other languages and language families. See, among many other references, Rizzi (2000, 2004b), Belletti, (2004b, 2009), Poletto (2000), Kayne & Pollock (2001), Pollock & Poletto 2004, Laenzlinger (2002), Cinque (1999), Villa-Garcia 2015, Bianchi & Frascarelli (2010), Bianchi, Bocci & Cruschina (2014, 2016), Botteri (2018) on Romance, and Grewendorf (2002), (2015), Radford (2011), Haegeman (2012), Frei (2004), Samo (2018) on Germanic, Frascarelli & Hinterhoelzl (2007) on the Italian – German comparison. The analysis was then quickly extended beyond the initial nucleus: Roberts (2004) on **Celtic**, Krapova & Cinque (2004), Rojina 2011, on **Slavic**, Puskas (2000), Jokilehto (2017) on **Finno-Ugric** (building on an important tradition of studies on the left periphery in Hungarian: Brody 1990, Kiss 1998, a.o.), Shlonsky (1998, 2015) on **Semitic**, Frascarelli and Puglielli (2010) on **Cushitic**, Aboh (2004), Biloa (2012), Bassong (2012), Torrence (2012), Hager Mboua (2014) on **African languages**, Jayaseelan (2008) on **Dravidian**, Tsai (2007, 2016), Paul (2005), Pan (2015), Si (2017) on **Chinese**, Endo (2007, 2016), Saito (2012), Maeda (2018), Bocci, Rizzi & Saito (2018) on **Japanese**, Pearce (1999) on **Austronesian**, Speas & Tenny (2003), Nevins & Seki (2017) on **American Indian**, Legate (2002, 2008) on **Australian,** Durrleman (2008) on **Creole,** Pfau and Aboh (2015) on different **Sign Languages**; in addition to much work in **Romance and Germanic**

dialectology (e.g. Poletto 2000, Beninca' 2004, Cruschina 2012, Manzini & Savoia 2005, Di Domenico 2012, etc.), and on **Classical** languages and diachrony (Salvi 2005, Danckaert 2012, Beninca' 2006, Franco 2010, Wolfe 2016), etc.

Various volumes of the Oxford Studies in Comparative Syntax (particularly the 11 volumes of the subseries The Cartography of Syntactic Structures), are devoted in part or completely to cartographic research: Cinque, ed., (2002), Belletti, ed., (2004a), Rizzi, ed., (2004a), Munaro & Benincà, eds., (2011), Haegeman (2012), Brugè et al., eds, (2012), Svenonius, ed. (2014), Shlonsky, ed. (2015), Tsai, ed. (2016), etc.. General overviews can be found in Cinque & Rizzi (2010), Shlonsky (2010), Rizzi & Cinque (2016), Rizzi & Bocci (2017). See also the SynCart site at the University of Geneva https://unige.ch/lettres/linguistique/syncart/home (organized by Giuliano Bocci, Giuseppe Samo, Karen Martini) for further information on cartographic projects.

Cartographic research has now started to influence language acquisition studies (e.g. with the "growing trees" approach, based on the hypothesis that higher zones of the map are acquired later than lower zones: Friedmann, Belletti, Rizzi (forthcoming)), and the study of pathology (this workshop, and the project headed by Prof. Michiru Makuuchi, with Prof. Yoshio Endo (Grant-in-Aid for Scientific Research（A）19H00532).

2. Invariance and variation

The maps arrived at in cartographic work express certain properties that are stable across languages, as well as variable properties: the issue of invariance and variation arises here as in so many other aspects of language.

If one compares two languages as distant as Italian and Japanese, one observes a stable backbone, with a uniform hierarchical structure of certain elements. For instance, in the left periphery, the sequence *che > se > di* (that > if > non-finite complementizer) of Italian (and other Romance languages), arrived at through transitivity arguments, is mirrored by the *no > ka > to* sequence in Japanese, with such elements co-occurring in a special construction like the "reported question", according to Saito's (2012) analysis. A uniform hierarchical structure, with Force/Report higher than Int(errogative), which is in turn higher than Fin(iteness) gives rise to opposite linear orders in the two language types, as a function of the headedness parameter (however headedness is formally expressed: Kayne 1994, Chomsky & Berwick 2016, etc.):

(3)   **Romance** (Rizzi 1997, 2013):

[Force/Report [Int [Fin [$_{IP}$ …] …] …] …]
    Che   **se**   **di**

Japanese (Saito 2012):

[… [… [… [$_{IP}$ …] Fin] Int] Force/Report]
          no   **ka**   **to**

If some properties of the sequence are uniform, other properties are clearly variable across languages. The left peripheral focus position (for languages that use the left periphery to express focus) is uniformly unique, whereas the topic position can be unique (English) or multiple (Romance) (Rizzi 2017). Moreover, if topic and focus can co-occur, the order generally is Topic > Focus, as in Gungbe (Aboh 2004); nevertheless some languages permit a Top position lower than left peripheral focus, with special interpretive properties (non-contrastive topic, as in Italian: Rizzi 2017, and below).

Clearly, principles and parameters are at play here. We want to seek principled explanations for the universal properties, and to postulate the appropriate system of parametric variation to capture the variable properties. Pursuing this enterprise, cartographic research may function as a powerful generator of empirical issues for theoretical comparative syntax, thus enriching the empirical basis of theoretical studies.

3. The ban against double topics: English vs Italian, and the relevance of locality.

Observable variable differences may result from primitive parameters, or from the deductive interaction between independent parametric differences and general principles. Let us consider here the difference between certain languages admitting a unique topic and languages permitting multiple topics.

The theory of locality can play a critical role here (Abels 2012, Haegeman 2012 , Rizzi 2013). English contrasts with Italian (and other Romance languages) in not allowing more than one topic DP:

(4)   A Gianni, la tua macchina, gliela darò domani
         'To Gianni, your car, I will it-to-him give tomorrow'

(5)a *? To Gianni, your car, I will give __ __ tomorrow
    b * Gianni, your car, I will give __ to __ tomorrow

(6)   Gianni, la tua macchina, lo ho convinto a comprarla
         'Gianni, your car, I him convinced to buy-it'

(7)a   John, I convinced ___ to buy your car
     b Your car, I convinced John to buy ___
     c * John, your car, I convinced ___ to buy ___

This difference may be amenable to an independent difference between the topic constructions in the two languages and the theory of locality. In Italian, an object topic is obligatorily resumed by a clitic (Clitic Left Dislocation):

(8)   La tua macchina, *(la) comprerò ___ l'anno prossimo
         'Your car, I it-will-buy ___ next year'

Cinque (1990) argued that clitic resumption is obligatory because otherwise a gap not bound clause-internally would be interpreted as a variable, and the topic, *per se*, is not an operator, hence a variable remains unbound in (8).

English has no clitics, so the language uses a null operator to connect the topic and the gap (Cinque 1990, based on Chomsky 1977):

(9)   Your car, Op   I will buy ___ next year

Null operators clearly are a grammatical options, used by many languages in such constructions as relatives, *easy to please*, parasitic gaps, etc. English uses this option for topicalisation.

The operator, a kind of functional equivalent of the clitic, is null in English topicalization, but may optionally be overt in other closely related languages, like Dutch (Koster 1978):

(10) Die man, (die)   ken   ik __
         'That man, (whom) know I'

A well-known locality effect is that an element cannot move across another element of the same kind, for instance a wh-operator across another wh-operator, a particular case of a general intervention effect captured by Relativized Minimality:

(11)a   What do you think **John** said __?

     b * What do you wonder **who** said __?

(12) Relativized Minimality: in configuration   … X … Z … Y … a local relation between X and Y cannot hold if Z intervenes, and Z is of the same type as X.   (Rizzi 1990, 2004, 2014)

Under this analysis, a representation with a double topic in English would involve an Op crossing another Op, a violation of Relativized Minimality, as in (13). The Italian/Romance construction involves no Op, so a configuration with multiple topics does not violate RM:

(13) * John **Op**,   your car **Op**, I convinced ___ to buy ___

It is not the case that English systematically disallows multiple movements to the LP. A topic can co-occur with a preposed adverbial PP:

(14)   Words like that**,** in front of my mother, I would never say __ __ (I. Roberts, p.c.)

Here presumably the adverbial PP can target the Mod(ifier) layer dedicated to adverb preposing, and different from the genuine topic position. Among many other distinguishing properties, preposed adverbials alleviate that-trace effects (Bresnan 1977), whereas genuine topics do not:

(16)a * This is the man who I think that __ will buy my house next year
     b   This is the man who I think that next year, __ will buy my house
     c * This is the man who I think that my house, __ will buy__ next year

If adverbial phrases (including adverbial PP's) can selectively target Mod, the representation of (14) is

(17)   Words like that **Op,** in front of my mother **Mod** I would never say __ __

In which RM is not violated (Op and Mod belong to different feature classes, in terms of the system of featural Relativized Minimality in Rizzi 2004).

In fact, "in front of my mother" has the same alleviating effect for that-trace that adverbial have:

(18) Here is the man who I think that, in front of my mother, __ would never say words like that

Haegeman (2003) has showed that this amelioration effect only arises if the adverb is moved clause-internally: an adverbial like *next year* can be extracted from an embedded clause, as in (19)a, but in that case it does not alleviate a that-trace violation:

(19)a   Next year, Paul says that Bill will sell his house
    b * This is the man who I think that, next year, ___ says Bill will sell his house

Presumably in cases of extraction like (19)a-b the adverb is not preposed to Mod, a process which is clause-bound (Rizzi 2004), and it must target a topic position (which is naturally accessible to a referential adverbial like *next year*), a position which is too high to give rise to the adverb effect, as we have seen in the case of (16)c.

Locality may in fact play an explanatory role in a variety of cases of ordering restrictions. Consider for instance the fact that Italian permits both orders Top > Foc and Foc > Top, but only in the former can Top be interpreted as a contrastive topic, i.e.,

(20)a   A Gianni Top , QUESTO Foc   gli dovete dire, e a Piero, qualcos'altro
        'To Gianni Top   THIS   Foc   you should say, and to Piero, something else'
        [+contr]

    b * QUESTO Foc   a Gianni Top ,   gli dovete dire, e qualcos'altro, a Piero
         'THIS   Foc   to Gianni   you should say, and something else, to Piero'
           [+contr]

    c   QUESTO Foc   a Gianni Top,   gli dovreste dire, non quello che avete detto
         'THIS   Foc   to Gianni Top,   you should say, not what you said'
           [- contr]

Why is (20)b deviant? Top, per se does not belong to the operator class, hence movement of the focal operator across a topic, as in (20)c, is fine. But if the [+contr] feature is an operator(-like) feature, a minimality effect arises in (20)b: the focal operator crosses a topic endowed with the operator(-like) feature [+contr]. On the contrary, no minimality effect is triggered in (20)a: here a topic endowed with the [+contr] feature crosses the focal operator, but this is fine in the spirit of the featural approach to Relativized Minimality (Starke 2001, Rizzi 2004, Friedmann, Belletti & Rizzi 2009): an element endowed with a richer featural

specification (topic and contrast) can be extracted from the domain of a featurally more impoverished element (the focused element, endowed with a "pure" operator specification).

The Italian left periphery differs from what is found in many other languages in that it permits a Top position lower than Foc, and this seems to be a primitive parametric option. But the fact that this low topic position cannot be contrastive can be deduced from locality, under natural independent assumptions.

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